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State of Pennsylvania

AND

AMERICAN REPERTORY.

JUNE, 1845.

Extract from an account given in the London Mechanics' Magazine of the late Boiler Explosion at Messrs. Samuda & Co.'s Manufactory.

We now publish full details of the circumstances of this deplorable accident, so far as they have been yet brought to light; and though they do not, perhaps, comprehend everything which it might be desirable to know, they disclose quite sufficient, we apprehend, to enable every one to form a tolerably correct opinion of the causes to which it is to be ascribed. The verdicts of the jury impute blame to the head of the establishment, Mr. Samuda, and something more than blame to his foreman, Lowe; blame to the former, for the general inefficiency of the engineering arrangements of his manufactory, and "manslaughter" to the latter for the fatal recklessness with which he endeavored to make up for the fault of his master. The buying of an old and discarded boiler to do the work of a considerable manufactory,—the employing a low-pressure boiler to do the work of a high-pressure one—the complicated and defective character of the arrangements for ascertaining and regulating the pressure—and the distance at which the boiler was placed from the engine, involving as it did a difficulty in keeping up the steam, and leading to all sorts of clumsy and hazardous expedients to obviate it—are all matters which came within the peculiar province of the head of the establishment, and which seem to us fully to justify the censure passed upon him by the jury. Indeed, rather more; for if a man sets another to do a thing manifestly perilous to life or limb (as this was,) and if especially he has the authority of a master over that other to command or forbid, he it is who is the real author of any calamity which may ensue.—

Qui facit per alium facit per se is an old and sound maxim. Mr. Samuda did not, to be sure, direct Lowe to prop up the valve lever, to prevent the valve from easing the boiler when charged beyond its power of bearing, (the ground apparently of the heavier offence of which the latter has been found guilty,) and cannot be supposed to have ever imagined that the man would act so foolishly; but it is, at least, equally true that if Lowe had had better machinery and tools to work with—*such machinery and tools as a judicious and discreet master would have provided him with*—there would never have been any occasion for his committing the gross indiscretion of which he was guilty.

The jury denounce "the application of low-pressure boilers to high-pressure purposes" as "highly dangerous," and recommend that "some legislative enactment" should be applied for, "to prevent, if possible, the fearful destruction of human life which arises under the present imperfect system." We agree with them that the practice is a "highly dangerous" one; but do not see that there is any necessity for invoking the aid of the legislature to put it down. The practice is an exceedingly limited one, and wholly unknown to all our first-rate engineering establishments (with the exception, perhaps of one or two, *not of the Thames.*) An instance here and there, or now and then, does not constitute a "system," nor a couple of fatal accidents in one establishment, such "a fearful destruction of human life" as the Collective Wisdom of the country alone can grapple with. A sufficient check to the spread of the practice will probably be found in the public obloquy, which every established case of disaster arising from it, must entail on the individuals guilty of it; and it is from a belief, that such checks can be administered through no channel so well as the public press, that we now contribute the aid of our columns to make the particulars of the present case as widely known as possible.

Fig. 2. Fig. 1.

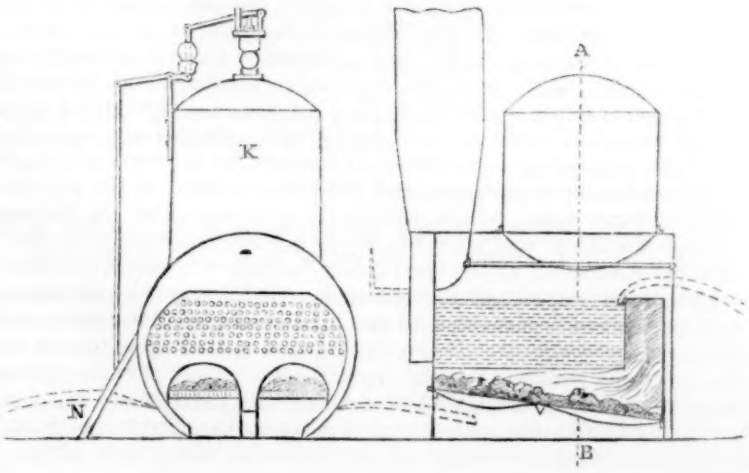
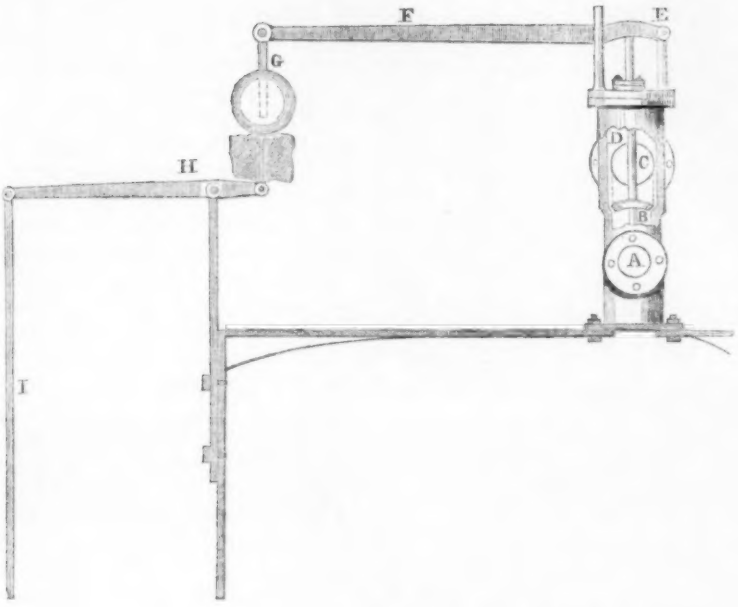


Fig. 3.



The engravings, Figs. 1 and 2, represent the boiler which was blown up; they have been reduced from the drawings exhibited at the inquest. Fig. 1 is a side elevation, and Fig. 2 a section on the line A B of Fig. 1. The boiler was on the tubular plan, and contained 182 tubes, each 5 feet 6¾ inches long, 2½ in diameter at the back, and $2\frac{1}{4}\frac{1}{32}$ ins. at the fire door. The boiler plates were of $\frac{3}{8}$ in. iron. The steam-chest (K.) which was 4 ft. 6 ins. in diameter, and 4 ft. 6 ins. deep, was made of $\frac{5}{16}$ in. iron. The crown of the boiler *had no stays;* an omission, the consequences of which the reader will find well pointed out in the intelligent evidence of Mr. Barnes. The dotted lines on the right hand, in Fig. 1, show the position in which the upper row of tubes (made of copper) was found after the accident—completely bent over, but still adhering at one end to their seats. The dotted lines in Fig. 2 show how the external case of the boiler was blown out to the right and left, in consequence of the steam taking the line of least resistance, that is, upwards through the *unstayed* crown. Fig. 3 represents, on a larger scale than in Fig. 2, the steam-valve arrangements. A, was the pipe leading to the engine; B the safety-valve, the inner diameter of which was $4\frac{3}{32}$ ins.; the outer, $4\frac{9}{16}$ ins. C waste-pipe leading to the chimney; D the interior of the valve-box, $5\frac{1}{32}$ ins.; E the fulcrum of F the lever. The length of the lever was 3 feet; the distance from the fulcrum to the centre of the valve and spindle 3 ins. G rod, 13½ ins. long, which carried two weights, one circular and the other square, suspended

from the end of the lever. H a second lever employed to control the first, 2 ft. long, and turning on a fulcrum 5 inches from the centre of the suspended weights; I hand-rod hanging from the lever H, by which the entire system of levers was moved. N (fig. 2) is the piece of wood with the nail in it (not seen in the figure) by which the levers were prevented from acting, and the explosion produced.

Neither the exact amount of the weights suspended from the first lever, nor the weights of the valve and levers themselves, appear on the face of the proceedings; and without these it is impossible to calculate the actual pressure to which the boiler was subjected. This is of no great consequence however; for, as suggested by Mr. Barnes and Mr. Farey, in their evidence, this is not a case where the question turns on the *particular amount* of pressure exerted, but where the stoppage of the valve set all calculations of resistance at defiance.

There were five persons killed by the accident; and there have been two Inquests, of the proceedings of which the following is an abstract, stripped of everything which has not some material bearing on the case.

Evidence before the Coroner.—Mr. Frederick Braithwaite, engineer, examined.—The boiler was what is termed a tubular boiler, the dimensions of which are stated in the plans given in. It was intended to drive one of a pair of 25-horses low-pressure engines on board the Waterman steamer, No. 11. It had been applied to that purpose. It could not make sufficient steam, and was taken out after it had been used some ten or twelve times. It was too small as regards the steam required to be created for that purpose. Had seen the boiler for several months standing on Fairbairn's premises, but had lost sight of it for months till he saw it after the accident. Did not know when Samuda bought it. The boiler was made about 18 months back—certainly within two years.

John G. Burnard examined.—Is a millwright and engineer, and was in the employ of Messrs. Samuda.—I cannot say there was more than 20 lbs., but I believe so. I did not weigh the valve. The handle of the safety-valve was propped up so as to prevent its acting.—There were two weights, one round, the other square; that on the safety-valve was square, (a plan was here put in illustrating the Witness's meaning. See fig. 3.) I saw the piece of wood placed against the boiler to keep the lever of the safety-valve up. Lowe told me to get a hammer and a nail. I could not get a hammer, so brought a chisel, and drove the nail with it. Lowe held the handle of the lever of the safety-valve whilst witness drove the nail into the wood. In doing so, Lowe pulled the handle down, upon which the steam blew off strongly. After the nail was driven, the piece of wood was placed under the handle of the valve, thereby supporting it, and preventing its action. I saw Lowe place the wood against the boiler, after which the nail was applied. The handle of the lever of the safety-valve, before the wood was brought, rested on a rivet in the boiler. The nail would not bear so much pressure as the rivet, although it would have the same effect. I removed the lever off the rivet several times, because I thought it dangerous, and that no one in their senses would do as Lowe had done, as it prevented the use of the safety-valve al-

together. When he left the boiler, the handle of the safety-valve rested on the nail. The explosion took place ten minutes or a quarter of an hour after. There was only one safety-valve. There was no steam-gauge on the boiler, but there was a water-gauge, which was broken. There were two gauge-cocks, but they were not put on in the proper place. The upper one blew off steam instead of water.

Mr. John Farey, C. E., examined.—Had seen the boiler since it had been removed from the spot where it stood at the moment of the explosion. The boiler had burst the exterior shell outwards; it had not collapsed. The boiler has been burst by a very intense pressure, which is not accountable for by any supposition of the safety-valve seen by witness being merely overloaded, but that it must have been fastened down, which circumstance rendered this case very distinct from most of the explosions on record. All the steam which was produced being retained and accumulated in the boiler to a pressure which burst the metal with extreme violence, projecting large pieces to a great distance through the air. One piece in particular had cut itself into the bricks of a wall at a considerable distance from the boiler, which showed that that particular piece had been projected with a velocity to be expected from an explosion of gunpowder, but not from the ordinary explosion of overloaded steam boilers. The earth whereon the boiler stood had been forced downwards by the violence of the explosion, that being a symptom frequently found in the explosions of gunpowder, but not a usual symptom in explosions of steam boilers. These appearances convinced witness, quite independently of any information to that effect, that the safety-valve had been fastened down; and the engines not working at the time to any speed which would consume steam, all that was produced was accumulated, and having little or no escape, or expenditure, that accumulation caused the explosion. It is quite true that 100 lbs. on the square inch could not have produced the effects he had seen there. Witness was no convert to the theory of the production of gas within a steam-boiler, or that the explosion of hydrogen gas could be produced, unless in cases where the boiler was nearly empty, and the iron red hot in the vicinity of water. There were no appearances in this case of that having taken place. Had never met with one case under these conditions. No atmospheric air can get into a boiler when under pressure. The supposition that hydrogen gas may be produced within a boiler is, that a portion of water has had its oxygen absorbed from it by the oxidation of the heated metal of the boiler. If that did take place, oxide of iron must be found in the boiler in palpable quantities. There were no appearances in the present case of any oxide of iron. Another supposition is requisite to account for an explosion taking place from the hydrogen gas supposed to be produced, viz., that atmospheric air, or oxygen in a gaseous state from some other source, should become mixed with the hydrogen, for it is only the mixture of hydrogen and oxygen, in their gaseous states, which is susceptible of explosion. The explosion being, in fact, a combination of the two gases, previously mixed in suitable proportions for combining, and by their combination at the moment of ex-

plosion, or ignition, they produce water. The supposition is that water is first decomposed, and afterwards recomposed. In the present case there were no symptoms of such having been the case, or of any oxidation. There were no appearances of deficiency of water in the boiler. The uppermost row of tubes, which must have been the first to have been laid dry by deficiency of water, were of brass, and show no symptoms of having been overheated; and if they had been overheated, brass would not absorb oxygen from water in sufficient quantities to have liberated any hydrogen. The tubes lower down were iron, and presented no appearance of having been red hot. No one can mistake iron that has been red hot. Has had many years' experience of explosions in gas works,—they were occasioned by a mixture of hydrogen gas and common air. Such explosions are always attended with fire and burning. Was acquainted with attempts some years ago to construct engines to be impelled by means of a vacuum and such explosive actions as substitutes for steam-engines. The symptoms attending such explosions are so distinct from anything belonging to this case, as to leave no doubt whatever on witness's mind, that the accident was not occasioned by ignition of gas, but by steam alone, confined and retained to an excessive pressure. There are two cases on record of similar explosion from safety-valves being fastened down. One of the earliest was a case of a boiler of one of the earliest attempts at locomotive engines; the other was at Lyons, where Mr. Steel lost his life. Except from gunpowder, never saw such an explosion as the present in its effects.

The Coroner, in summing up, observed that in his opinion, the evidence showed, most distinctly, there had been an undue pressure of steam upon the boiler; and he could not but lament that the remarks which fell from him upon the occasion of the inquest on the parties killed by the explosion on board the Gipsy Queen had not had more effect in inducing a proper degree of caution.

The jury retired for half an hour; and on returning into court,

The Foreman stated that it was the unanimous opinion of himself and brother jurors that "George Lowe was guilty of manslaughter." The foreman said he was further instructed by the jury to express their opinion "That the machinery employed on Mr. Samuda's premises was altogether of an inefficient character."

The Coroner said he quite agreed with the verdict of the jury; and he hoped that the caution with which they had accompanied it would have a proper effect on Mr. Samuda.

On the Condition and Ventilation of the Coal Mine Goaf. By Prof. Faraday.

None of our readers can have forgotten the terrible loss of human life which occurred at the Haswell Colliery, in the county of Durham, last September. Ninety-five persons perished in an explosion within that mine. Professors Lyell and Faraday were immediately sent by the Secretary of State to attend the judicial investigation which was

held in consequence of the accident, and to inquire into its cause.—These gentlemen have since made a Report to the proper authorities, which is now before the public; and the object of Prof. Faraday's communication was, to illustrate by experiment what he had represented in that document. The arrangement adopted by the Professor invited attention, 1. To those parts of the mine in which the explosion occurred. 2ndly, to the circumstances of the calamity. 3rdly, to the means of preventing the recurrence of a similar accident. 1. With respect to the locality of the explosion. It appears to have occurred at a spot in the mine which Professor Faraday described with great accuracy: this is called *the goaf.* In working a mine, low, narrow passages, at right angles with each other, are cut through the seams of coal. The square masses made by these passages are called pillars. These pillars are gradually cut away, and replaced for a while by systems of wooden props; and the place where these props replacea pillar is called a jud. In time the jud is removed, and then the unsupported roof of the mine falls in. The heap of ruins thus occasioned by the successive drawing of contiguous juds is called by miners *a goaf.* When the mine is deep, and has been long worked, the size and height of the goaf are enormous: one of the goafs at Haswell extends over thirteen acres, and the height of it cannot be ascertained. Corresponding with this heap of rocky fragments, and produced by it, is a cavity in the mine like an inverted basin, including a thin belt of air which surrounds, and partly permeates, the goaf. It is this aërial space which Professor Faraday regards as a magazine of danger.—The air itself is, or may be, the fire-damp (the light hydro-carbon gas) and common air, mixed in very various proportions. The lightness of this gas, and therefore of the mixture, causes it, if present, to ascend into the upper part of the goaf cavity, which is then converted into a reservoir of explosive matter. Prof. Faraday, secondly, described the probable circumstances of the accident as it happened.—Some disturbance of the goaf-cavity, occasioned by the drawing of a jud, and possibly a change of the pressure of the atmosphere, diffused the fire-damps through the workings at that place. This, when lighted, would, by the explosion, raise, and then kindle, the coal-dust which is always abundantly pervading the passages; and these effects must, in a moment, have made the part of the mine, which was the scene of the calamity, to glow like a furnace. This conflagration was necessarily succeeded by vast volumes of the poisonous choke-damp (carbonic acid gas,) so that it was humanly impossible for any one within the range of the explosion to have escaped alive. Prof. Faraday then entered, thirdly, on the most important part of his subject, viz. *the prevention of such calamities when occasioned by the goaf.* He proposes the ventilation of the goaf. He expressed his opinion, that it would not be so well to attempt this by driving the contents of the goaf through any parts of the mine which are occupied by human beings; but he exhibited how the goaf-cavity might be exhausted of noxious air by means of a pipe rising as high as possible—from four to eight or ten feet—into it, and communicating at its other extremity with the return way, or the upcast ventilation-shaft. He illustrated

the readiness with which this might be done, by most conclusive experiments. He filled a glass vessel (which represented the goaf-cavity) with inflammable air, smoke, &c., and then exhausted it in a few seconds, by means of a pipe communicating with the flue of one of the small furnaces in the theatre. He used tubes of thin sheet iron and of air-proof cloth for experiments on large and rapid currents, proposing (to avoid the effect of excess) to suspend them, or place them on props in the open space of any passage most convenient for the purpose; and said that such a tube, or even others made by nailing four boards together would be sufficient for the purpose. He showed that the terminal ends of these need not be reversed every time the upper end of the goaf changed its form, and concluded by confuting objections that had arisen in his own mind, or might be urged against the details of the arrangement he recommended, and stated his belief, that it was in reality as practicable as it was theoretically unimpeachable. Lond. Athenæum.

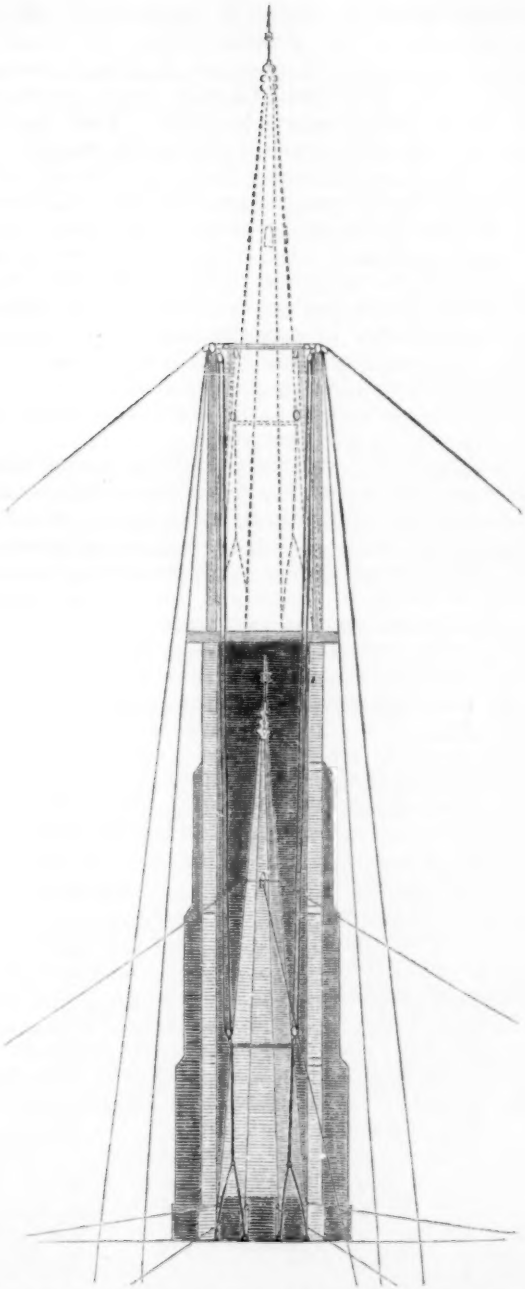
Expeditious Bridge Building.

Mr. Dredge has just erected a bridge over the Blackwater river, county Tyrone, Ireland. This Bridge has been in contemplation nearly forty years, the only obstacle being the immense expense of any structure on the old system, and probably for forty or a hundred years more the county would have been deprived of the advantage now conferred, but for Mr. Dredge's estimates, and his highly-approved plan. Mr. Dredge has not added much to the long delay, by any dilatory process of construction; when the iron was on the ground he astonished the public with the rapidity of the work, the bridge being extended and completed *in one week.* The bridge is 74 feet span, and for the heaviest traffic. It was erected at the cost of the Earl of Caledon.—*Wiltshire Independent.*

Account of the Raising of the Spire of the Church of the Nativity, in Spring Garden, Philadelphia county. By N. Le Brun, Architect.

Communicated for the Journal of the Franklin Institute.

The Doric tower on which this spire was raised, faces the east, and is 90 feet in height, it is strengthened at the angles by four double buttresses, projecting at the base four feet; the projection of these buttresses is diminished at four stages in their height. The interior figure of the tower at the base is a square, but mid-way it assumes the figure of an octagon by gathering over the brickwork at the angles; the whole forming a construction of the most solid character. The octagonal spire, which was finished complete in front of the tower previous to raising, is 80 feet high, including its crowning ornaments; its width at the base is 12 feet 6 inches.



RAISING OF THE SPIRE OF THE CHURCH OF THE NATIVITY.

The spire was raised by means of two derricks situated on the north and south walls on the top of the tower, and placed about 18 inches behind the front posts of the spire, or about 3 feet back from the front of the tower, and were 13 ft. 6 in. apart, allowing about 6 ins. on each side between them and the spire. Their feet were made convex and fitted into corresponding concavities worked in the oak sleepers which were securely bolted down into the sills of the spire, which sills were themselves secured to the tower by 1½ inch iron rods 36 feet long and built in the angles of the tower walls. To avoid all the strain being thrown on the top of the walls at these points, diagonal braces were placed, extending 40 feet down the tower, and as an additional precaution to prevent the derricks from slipping at the heels they were connected by lashings fastened to iron bolts passed through them,—the heads were connected by two tackle blocks, which were only of use to keep them in their position till the spire was being raised. The guys from each of the derricks, extended in three directions over the neighbouring commons.

The spire was connected with the derricks by four double lashings, (each end of which was fastened to one of the spire posts at the foot,) and two spans; the belt which connected the spans, was 30 feet high above the base of the spire, (being about 5 feet above the centre of gravity) and passed through the straps of the purchase blocks. The falls from the treble blocks on the derricks to the leading blocks, were in the interior of the tower, and the two capstans used, were placed in the main story of the church and were each manned by twenty men. Attached to the base of the spire were three guys and at about 25 ft. from the head were four more guys, all secured to guy posts.

All the arrangements having been made with the greatest care, on the 10th of February, at two o'clock in the afternoon, the raising was commenced, and it was performed with the greatest ease. The spire was kept plumb by the management of the guys attached to it. As the derricks were but 42 feet high and the belt to which the purchase blocks was fastened was 30 feet from the base, (at which height the distance from each derrick head to the spire would be about 3 feet,) there would be but 6 feet between the blocks when the spire would be raised;—they would thus necessarily have lain almost horizontal, and caused a great strain on them; to avoid this strain, as the raising was progressing, the north and south derrick guys were slackened to make the purchase blocks work more perpendicularly.

When the spire had been raised to its proper height in front of the tower, the two west derrick guys were worked by two crabs to draw over the derricks and swing the spire to its destined position. It had been deemed most prudent to work them in that manner, as in the hauling in of the back guys in the usual manner, an oscillatory motion might have been communicated to the spire, which would have rendered it difficult to manage at this most critical moment. The raising lasted one hour and thirty minutes, and thirty minutes was required to secure it firmly to the sills on the tower by the iron straps;—thus the whole operation occupied two hours.

On the Causes of the great Versailles Railway Accident. *By* J. Gray.

From various facts and circumstances connected with the accident on the 8th of May, 1842, on the Left Bank Paris and Versailles Railway, Mr. Gray became convinced that nothing but a failure in the front axle of the *Matthew Murray* engine could have been the first cause of her right hand front wheel first slipping within the rail; and having the inquiry thus far concentrated, he proceeded with an examination of that axle, and of the facts and incidents connected with its failure: and he came to the conclusion that, with good materials and proportions, and the axles in a state of repose as received from the forge, or, in other words, perfectly free from the effects of cold swaging, or hammer hardening, an axle in such a state, and of ample dimensions for its intended work, will effectually resist fracture for any period the wear of the journals may enable it to run; but if the dimensions be deficient, the iron will be taxed beyond its permanent cohesive power and elasticity; and, however slight the excess of exertion and fatigue may be, a gradual and inevitable dissolution of particles must result; but, beyond this, he had not met with anything, either in print, in observation, or in the course of experience, that would at all warrant a belief in iron necessarily changing its quality, or becoming crystalized by forces within the range of its permanent cohesive force and elasticity.

AMERICAN PATENTS.

List of American Patents which issued in the month of October, 1844, with Remarks and Exemplifications. By Charles M. Keller, Examiner of Patents.

1. For a machine for making *Bricks from Untempered Clay;* Benj. H. Brown, Philadelphia, Pennsylvania, October 3.

The clay, as it is taken from the bank, is deposited in a hopper by elevators, and from the hopper it passes between two rollers, that move with different velocities, by which it is drawn through in thin cakes, and thrown on to a set of permanent teeth, and there cut up by the action of sets of teeth on a roller that work between the permanent teeth. It is then conducted by a spout into a movable mould, which, when filled, slides under a piston, actuated by a cam, to be compressed and formed into a brick, which is then discharged by a follower, actuated by another cam that forms the bed of the mould.

Claim.—"I do not claim the use of the cams for operating the pistons in pressing brick, nor do I claim the manner in which the bricks are received, compressed, and delivered; but what I do claim as my invention, and which I desire to secure by letters patent, is the arrangement of the two cams for effecting the pressure and delivery of the bricks, in combination with the pistons and movable mould.

I also claim the combination of the rollers and pins for pulverizing the clay as above described."

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2. For a mode of *Marking and Lettering Packages;* Wm. Francis, and Wm. Johnson, Waynesville, Haywood county, North Carolina, October 3.

The patentees say—"The nature of our invention consists in running a composition of glue or molasses (with other materials if deemed necessary to elasticity and preservation) into moulds of letters, figures and devices, &c., formed on lines, upon which (while in a warm state) is applied thin slats of wood, or other substance, of the width of the lines, with beveled edges, which adhering to, is drawn with the composition from the moulds; when said composition becomes properly cooled, the moulds being previously oiled, these slats, when cut or separated between the letters, form type. The type when made are placed in the order required on a hand press formed of bars of wood or other material, with wire or other springs placed at regular distances fastened on said bars, on the top or surface of which said springs, are attached small blocks of wood, or other material, forming a smooth level surface, on which are placed the type, and fastened by means of slides, or otherwise, the springs admitting the type and blocks on which the type are placed, to play in a groove formed in the bars of the press, for the purpose of giving way when the face of the type touches an uneven surface, or until the whole surface of the type, and that of the package or article marked, come in complete contact with each other."

Claim.—"What we claim as our invention, and desire to secure by letters patent, is the hand press constructed as herein described, and, in combination therewith, type formed of an elastic substance, composed of glue and molasses, or other material when deemed necessary; to be used by means of said presses, with the aid of springs or other similar means, and other fixtures, as herein described, so as to insure the successful application of the type to even or eneven surfaces, using for that purpose any material or compound that will produce the intended effect."

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3. For an improved apparatus for *Separating Liquids by Centrifugal force from Sugar and other Substances;* Joseph Hurd, Shoreham, Middlesex county, Massachusetts, October 3.

Claim.—"My invention, and that which I claim as an improvement, consists in the employment, in the manner set forth, of a cylinder, or other proper shaped vessel, capable of receiving and holding a mass of sugar, or other material, and whose sides are composed of a porous material of such strength and character as will retain the mass of sugar, or other substance to be operated on, and at the same time permit the passage of the liquid matters (proceeding from the mass) through them, when the said vessel is put in such rapid revolution as to generate in the liquid, or liquids, a sufficient degree of centrifugal force to expel it, or them, from the mass as described. And in

combination with a vessel so arranged and operated, I claim the cistern, wholly or partially surrounding the same, or so connected with the same as to catch and retain, or suffer to escape into a proper receptable, the liquid matters as they are expelled from the mass in the vessel, and I further claim the combination with the vessel, of a means of supplying water or other cleansing liquid to the central or other suitable part of the mass of sugar, or other material to be cleansed, for the purpose of dressing, or cleansing, &c., as set forth. Also the manner of dressing or cleansing sugar, or other matters susceptible of being so dressed or cleansed, viz: by passing a current of water, or other suitable cleansing liquid, into the interior of the mass, and from thence driving it through and out of the mass by centrifugal force, substantially as explained."

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4. For an improvement in *Friction Matches;* Elisha Smith, Erving, Franklin county, Massachusetts, October 3.

The patentee says—"I do not claim the combining with phosphorus, or other inflammable substance, an earthy incombustible material mixed with it, or made by means of a glutinous substance (such as glue or gum arabic) to adhere to and surround and protect it from oxidation, or the absorption of moisture; neither do I claim the employment of glue, or a gelatinous liquid or substance, for the purpose of cementing the phosphorus and protecting material together; because I believe that such earthy and gelatinous materials, whether together, or separate from each other, have long been employed both in this and foreign countries for such purpose. But that which I do claim consists in the employment, in the manufacture of friction matches, of *combustible* materials, such as pulverized dried bark, wood, or other *vegetable* matters substantially the same in character, instead of mineral and other substances, for the purpose of protecting the phosphorus or inflammable substance, and for giving consistency or body to the paste, as above set forth. And, particularly, I claim the using of vegetable matters (such as hemlock bark, oak bark, sumach, nut-galls, &c.) containing more or less tannin, and which, when combined with the glue or gelatinous adhesive mixture, form "*tanno gelatin*," or an insoluble substance, which, although almost, if not entirely proof against the absorption of moisture, will readily be consumed by fire —the whole being substantially as hereinbefore explained."

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5. For an improvement in the *Life Preserver;* Adoniram Chandler, New York city, N. Y., October 3.

This is for an improvement on the life preserver patented to Jos. Francis, as assignee of C. A. De Liancourt, on the 10th of May, 1844, and noticed in the present volume, page 51, to which the reader is referred.

It is alleged that the Liancourt life preserver is liable to collapse, in consequence of the elliptical form of its transverse section, to avoid which, under the present patent, it is composed of two helical springs placed and connected together side by side.

Claim.—"What I claim as my invention, and desire to secure by letters patent, is the uniting of two helical springs, in the manner described, for the purpose of distending the air-bag of a life preserver, essentially in the manner described herein."

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6. For improvements in the machine for *Cutting and Crushing Corn Fodder;* Rudolph Miller, York, York county, Pennsylvania, October 3.

The cutting part of this machine is similar to a straw cutter with the knives attached diagonally to two heads on a shaft, the fodder being fed up by fluted rollers. The cut pieces pass from the cutting part to a roller armed with teeth which pass between similar teeth in a concave, and are thus crushed.

Claim.—"Having thus described the manner in which I construct my machine for cutting and crushing corn fodder, and shown the operation thereof, what I claim therein as new, and desire to secure by letters patent, is the manner in which I have arranged and combined the cutting, and the crushing, or rubbing, apparatus, substantially as set forth."

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7. For an improvement in the machine for *Boring Timber;* Thomas J. Russell, Franklin Square, Columbiana county, Ohio, October 3.

Claim.—"What I claim as my invention, and which I desire to secure by letters patent, is the combination of the racks *b*, bars *c*, screw *g*, and hooks *h*, for holding the portable frame, containing the boring tool firmly down upon the article to be bored, in the manner set forth, for boring holes at any required angle with facility and accuracy."

At each end of the machine there is a bar provided with two racks that pass through mortises in the lower sills of the frame of the boring machine, which are provided with springs and dogs to catch in the rack teeth. A screw with a crank handle passes through each sill and swivels in the bar, by means of which the frame of the machine can be elevated and depressed when the bars rest on the timber to be bored, and by means of the racks, any inclination can be given to the frame. In addition to the bars and their appendages there are pendent hooks jointed to the frame, which extend under the timber, so that by turning the screws which elevate the frame, the timber is griped between the bars and the hooks.

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8. For a *Gathering Hook, for gathering in grass, weeds, &c., in the operation of ploughing, to be covered by the earth;* Dudley Hill, East Hartford, Hartford county, Connecticut, October 7.

This is a curved hook, attached to the coulter or beam of a plough, that runs in the opposite furrow and drags all the weeds, grass, &c. which are covered by the earth thrown up by the mould-board that follows.

Claim.—"I do not claim as my invention the coulter connected with the hook; but what I do claim as my invention, and desire to secure by letters patent, is the "gathering hook," as described and contem-

plated in this specification, applied to ploughs for gathering in grain, grass, weeds, &c., to turn them under the sod in ploughing."

9. For an improvement in *Bedsteads;* Isaac Cooper, Johnstown, Cambria county, Pennsylvania, October 7.

This is for an arrangement of springs to distend the sacking, which is attached to four rods placed above, and connected with the rails of the bedstead by springs.

Claim.—"What I claim as my invention, and which I desire to secure by letters patent, is the combination and arrangement of the springs and rods with the sacking bottom and rails, as before described."

10. For an improvement in *Saddle-trees;* Samuel Ringgold, Major U. S. A., Fort McHenry, Baltimore county, Maryland, October 7.

The pommel and the cantle of this saddle-tree are each made of two pieces let into, and lapped over each other at the curved part, and extending down to the side bars, which rest on the ribs of the horse, and are separated from each other sufficiently to leave the vertebræ free and untouched. The pommel and cantle are braced by metallic arch pieces riveted to the outer faces, where the pieces of which they are formed lap. The side bars extend back of the cantle, and are there covered by metal plates bent up, and also secured to the cantle. In the claim, the side bars are designated by the letters A A, the pieces forming the cantle by the letters B B, those forming the pommel by the letters C C, the arch pieces by the letters D D, and the metal covering of the extension of the side bars by the letter V.

Claim.—"What I claim as my invention, and desire to secure by letters patent, is the construction of the pommel, by the union of two pieces for the formation of the arch of the pommel, and the construction of the cantle by the union of two pieces for the formation of the arch of the cantle; and the combination of the several constituent parts of the saddle-tree in union with each other, in the manner described in the foregoing specification.

"I claim, also, the combination of the parts A A, B B, C C, D D, and V, of the saddle-tree, in the manner substantially the same as set forth—that is, in such manner as to give to the rider the position and ease as herein set forth; the same giving comfort to the horse, and to the saddle a marked character, by which this saddle may be easily distinguished from all others known."

11. For an improvement in the *Nursing Apparatus and Breast-Shield;* Eugene Dudley, New York city, N. Y., October 7.

This improvement consists in making the mouth piece, which enters the infant's mouth, of ivory, rendered flexible by eliminating from the bony material the carbonate and phosphate of lime in the manner well known in the arts.

Claim.—"Having thus fully described my invention, I proceed to point out those parts which I deem novel and of new effect. What I claim as new, and desire to secure by letters patent, is the applica-

tion of flexible ivory, substantially in the modes, and for the use and purposes set forth."

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12. For an improvement in the *Lamp for burning Camphine or Turpentine;* Christopher West, Baltimore, Maryland, October 7.

Two rings are put on the wick tube, one at the bottom, and the other within $\frac{1}{16}$th of an inch from the top. These rings are equal in thickness, and form a space for the reception of the usual cloth conductor, over which the wick is put, and the space between the wick and the tube above the upper ring forms a receptacle for catching the gum, &c., arising, as it is said, from the burning of camphine or turpentine."

Claim.—"What I claim as my invention, and which I wish to secure by letters patent, consists in the combination of the rings, with the tubes, in the manner and for the purpose above specified."

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13. For a machine for *Cutting India Rubber into threads or strips suitable for the manufacture of corrugated India rubber goods;* Henry G. Tyer, and John Helm, New Brunswick, Middlesex county, New Jersey, October 9.

Claim.—"What we do claim in the above described machine, and desire to secure by letters patent, is the use of a series of circular knives running with great speed in water, in connexion with a small grooved roller, each knife working without friction in its separate groove, both turning in the same direction, but with unequal speed —say the knives to the rollers as 100 to 1.

We also claim and desire to secure the use, in connexion with this machine, of another small and smooth roller for the purpose of pressing the sheet in its passage evenly and uniformly on the grooved roller, thereby preventing the clogging of the material, and without which the machine would not be so efficient in action; whereby we cut and divide a sheet of rubber of any desirable length into separate threads perfectly and effectually, without injury to the strength and elasticity of the material; the whole operating substantially as above set forth."

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14. For an improvement in the machine for *Cutting Bread;* Franklin Roys, Berlin, Hartford county, Connecticut, October 9.

This is a modification of the knife used in the shops for cutting chewing tobacco, one end of which is jointed to a standard and the other guided by sliding in a slot in another standard. The improvement in question is for giving to the knife a drawing cut, by making an elongated hole in the jointed end, which slides on a pin, and having a brace jointed to the back of the knife and the standard—the handle end being guided in the usual manner.

Claim.—"What I claim as my invention, and desire to secure by letters patent, is the stud, with the slit to guide the knife perpendicularly, the brace applied to the knife to give the drawing stroke or cut, and the slit in the end of the knife.

15. For an improvement in the apparatus employed in the process of *Extracting and Rendering Lard, Tallow, and Oil from Concrete substances, and for refining the same;* Ebenezer Wilson, Cincinnati, Ohio, October 9.

The material from which the lard, tallow, &c. is to be rendered, is put, bones and all, into a large vertical cylindrical vessel provided with a safety-valve, mall-hole, &c. A perforated steam pipe from a steam boiler is coiled on the bottom, and about six inches above this there is a perforated false bottom, on which the material to be rendered lies to protect the steam pipe and give free egress to the steam. In the middle, the false and real bottoms are perforated with a hole of sufficient capacity for the discharge of the refuse matter; and around this hole the two bottoms are connected with a tube, to the upper end of which a valve is ground perfectly tight, the valve being provided with a rod extending up through a stuffing box at the top of the tank, to afford the means of opening and closing the valve, and downwards, and provided with a screw at the lower end which takes into a nut to fasten and hold it down. The tank is also provided with a try-cock near the top, and six or more other cocks, placed at equal distances apart from near the false bottom to about the middle of the height, for drawing off the rendered lard, &c., the apertures to these cocks being protected by a strainer.

After the tank has been charged, steam of very high pressure is to be admitted for a sufficient length of time to extract all the lard, tallow, &c., after which it is drawn off, and the refuse discharged through the hole by removing the valve.

Claim.—"Having fully described the nature of the apparatus which I use, and of the process which I follow, for the rendering of concrete fatty substances, I do hereby declare that I do not make any claim to the rendering of such substances by the introduction of steam into open vessels, in which they are contained—this having been previously done; but what I do claim as constituting my improvement, and desire to secure by letters patent, is the manner set forth of arranging and combining the respective parts of such a vessel: that is to say, I claim in combination the vertical tank, perforated false bottom, and discharging hole—such hole having a cover, to be operated upon in the manner and for the purpose set forth; the said tank being also furnished with a series of cocks, guarded on the interior by a strainer; the whole being so formed and arranged as to attain the proposed end, by means substantially the same with that herein fully made known."

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16. For a *Wool Combing Machine;* Ezra Gould, Paterson, Passaic county, New Jersey, October 9.

In this machine combs are arranged on radial bars attached to the face of a disk-wheel, in such manner as to be parallel with the face of the disk, and at right angles with the radial bars from which they project; and these, in combing, act in conjunction with teeth or combs, radiating from the rim of another wheel, and also carry the fibres around, to receive the action of rotating brushes.

Claim.—"What I claim as my invention, and desire to secure by letters patent, is arranging the combs, pins, card teeth, or brushes, in rows, radiating from a common centre, and parallel (or nearly so) with the face of a wheel, when attached to the wheel, or to arms projecting from a wheel, or to a plane corresponding to the face of a wheel, or when they are attached to arms simply projecting from a shaft, as herein described. And the employment of a comb, brush, &c., thus constructed, in combination with combs on another wheel, for the purpose and in the manner substantially as described."

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17. For an improvement in the *Coupling and Stuffing Box for shafts, specially intended for submerged propellers for Ships;* R. F. Loper, Philadelphia, Pennsylvania, October 9.

The outer tube of the stuffing box, instead of being permanent, is tapped into a metallic casing surrounding it so as to admit of screwing it over the lapped or other joint of the shaft, so that when this tube is drawn in, the two shafts can be separated, and if desired, the propeller drawn up out of the water, and when screwed out, passes over and prevents the two shafts from being separated.

Claim.—"Having thus fully described my improvements, what I claim therein, and what I desire to secure by letters patent, is the before described mode of employing the cylindrical tube for the double purpose of a coupling box and stuffing box, by combining it with the coupled shaft and with the other portions of the stuffing box; by which arrangement much room is saved, and great simplicity attained —all as herein described."

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18. For an improvement in the mode of *Setting Logs on the carriages of saw mills;* John B. Squire, Liberty Township, Crawford county, Ohio, October 9.

The slides on the head and tail blocks, to which the dogs for securing the log are attached, are provided with a toothed rack operated by a hand on one arm of a toggle joint, the other arm being jointed to its appropriate block, which is also provided with what the patentee terms a "driver," one end of which bears against the joint of the toggle, and the other projects beyond the face of the block sufficiently far to strike against a rest on the floor of the mill, when the carriage is run back, to force the slide the distance required for the setting of the log.

Claim.—"What I claim as my invention, and desire to secure by letters patent, is the method of moving the slides of the head and tail blocks simultaneously, as the carriage is gigged back, by means of the toggle-joints, combined with the slides to which the log is dogged, and the drivers for operating the toggle-joints in the manner and operated in the way above described for setting both ends of the log simultaneously, whilst the saw is in the groove of the head block."

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19. For an improvement in the machine for *Stretching the threads, or strips of India-Rubber, and covering the same with cloth in the*

manufacture of India-Rubber Shurred Goods; Horace H. Day Jersey city, New Jersey, October 12.

The patentee says—"The nature of my invention consists, in combining with rollers constructed with elastic surfaces, certain drums and other appurtenances with elastic surfaces for stretching threads of india rubber to any given desired length, and the covering of said threads with india rubber cloth on both sides.

Claim.—"I do not intend to confine myself to any particular number of ruddles, combs, or friction rollers, intending to use as many such as may be necessary to do the work in the most advantageous way. Nor do I limit my claim to any particular contrivance by which to produce unequal speed between the friction and compressing rollers, using any such as will answer the purpose.

"I do not claim the invention of compressing or calender rollers, or the gearing with which they are driven; the same having been in common use in the manufacture of India-rubber, and for other purposes. I do not claim the rollers on which the cloth which is to cover the threads is beamed up or rolled, the same having been in common use in India-rubber and other factories. Nor do I claim the drums, or cog wheels, or bevel wheels, as new in themselves. I do not claim that part of the side frame in immediate contact with the table, and in which the compressing rollers revolve—such part being in common use in India-rubber and other factories. What I now do claim as my invention, and desire to secure by letters patent in the above described machine, is the combining with two compressing rollers, one or more friction drums or rollers, covered with suitable friction material, and combining with these the roller, together with the spool, an elastic band or apron to which the threads of India-rubber are attached. The whole being connected and working together in manner substantially as above set forth and made known."

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20. For an improvement in the machine for *Cutting Tallow and other articles;* Zabria Ellis, Kensington, Philadelphia county, Pennsylvania, October 12.

On a shaft there is a series of circular knives placed at given distances apart, and on another shaft, parallel thereto, there are angular knives placed at such distances apart as to correspond with, and play between the circular knives, and these two shafts are geared together so as to cause the circular knives to rotate with greater velocity than the angular ones. Scrapers are also placed between the knives composing the two sets to scrape off substances cut by them.

Claim.—"What I claim as my invention, and desire to secure by letters patent, is the combination of the circular and angular knives, as described; and also, in combination with the same, the scrapers, operating in the manner and for the purposes above set forth."

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21. For improvements in the machine or apparatus for *Shaping, &c., Hats made of Leather and other substances, and retaining them in shape whilst wet;* Randal Fish, New York, N. Y., Oct. 12.

Claim.—"Having thus fully described the nature of the machinery

used by me for forming hats and caps of leather, skins, or other fabric, and shown the manner in which the same operates, I do hereby declare that I do not claim either of the parts taken individually; but what I do claim as my invention, and desire to secure by letters patent, is making the spring clamp band conical, that the hat may be sized whilst the band is on; and I also claim this band provided with a screw, or other adjustable clamp, in combination with the bed provided with a groove in which the band lies, and from which it can be withdrawn with the hat whilst clamped around it, as described.

"I also claim the combination of the hoop with the adjustable band for clamping the brim of the hat, to hold it whilst under the operation of the machine, and after it has been removed to admit of sizing, which could not be effected with clamp plates."

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22. For an improvement in the *Straw Cutter;* E. Taylor, Rochester, Monroe county, New York, October 12.

Claim.—"I am aware that a shaving or sliding cut has been given to the knife, by attaching each end to a connecting pendulous arm, in the manner of a parallel rule; and therefore I wish it to be understood that I do not claim this as my invention. But what I do claim as my invention, and desire to secure by letters patent, is the arrangement of the hand lever in combination with the knife, so arranged as to give a parallel sliding or shaving cut, and with the apparatus for feeding the straw, one arm of the hand lever constituting one of the parallel or pendulous arms of the knife, and another arm being provided with a segment mitre-wheel to operate the feeding apparatus as described."

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23. For an improvement in the *Bureau Bedstead;* Henry W. Kingman, New York city, New York, October 12.

Claim.—"I do not claim to have invented any of the parts herein shown, when taken by themselves; but what I do claim, and desire to secure by letters patent, is the making an article similar to a bureau or other piece of furniture, in the exterior appearance, and fitting the same to open in the parts *b*, *g*, *h*, *i*, and *d*, and legs 1 and 2, so as to attain the means of converting the article into a compact bedstead with great convenience, and at a moderate cost, with the several parts constructed and operating substantially as described."

The piece of furniture resembling a bureau is divided into two parts, the back indicated in the claim by the letter *b*, and the front indicated by the letter *g*,—these are hinged to the pedestal of the bureau and fall back and front, the top of the bureau being attached to the back and constituting, when opened, the head of the bedstead.—The part designated by letter *i* resembles a drawer, but conceals the front legs *h*, to support the front when let down. The legs for the back, are jointed to the back and to a rod 2, which is also jointed to the pedestal in such manner as to throw out the legs when the back is let down, and fold them when thrown up. And the part designated by the letter *d*, is that part of the bottom of the bed which covers

the pedestal when the bedstead is opened—it is jointed to the front and lays over on to the back, or vice versa; or it may be made in two, jointed to the pedestal, and laid over on to the front and back.

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24. For an improvement in *Lamps for burning volatile ingredients*; Isaiah Jennings, New York city, New York, October 12.

In this lamp the ingredients are placed in a reservoir above the burner and connected with it by a pipe provided with a stop cock like gas burners. The horizontal part of the pipe, between the burner and stop cock, is filled with cotton cloth through which the volatile ingredients have to percolate when the stop cock is open. The horizontal part of the pipe ends in a bulb, from which rises the vertical part of the tube of the burner, and that is filled with a roll of cotton cloth.

The burner has the following peculiarity in its form—"The apertures which constitute the jets for the flame, open into a groove, on the outside; the use of which is to protect the issuing vapor from the action of the ascending current of air always produced by the heat from combustion; this ascending current, when it strikes the gas or vapor, immediately at its issue, has a disturbing influence on the flame, which is effectually corrected by the groove."

Claim.—"Having thus fully described the nature of my improvements in the lamp for burning volatile ingredients, what I claim therein as new, and desire to secure by letters patent, is the manner of regulating the supply by the combined operation of the filling with cotton cloth, or other similar fibrous substance, in the parts designated, together with the packing of wire interposed, and the termination of the supply opening in a cylindrical stopper of straight wire immediately below the burner, as described. I claim, likewise, the employment of the groove in the burner, made in the manner and for the purpose set forth. I do not claim either of the individual parts of the packing embraced in the first claim, but limit my claim to their combination with each other, substantially as set forth."

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25. For an improvement in the *Winnowing Machine for Cleaning Grain*; Calvin O. Guernsey, Russia, Herkimer county, New York, October 12.

There is a lever, for agitating the sieves, connected with them near the upper end, its lower end being connected with the frame by a joint link, and its upper end jointed to the lower end of another lever which has its upper end jointed to an arm of the hopper bottom, that passes through a horizontal slot in the frame. This last lever is jointed to a crank, so that by this connexion of parts, the hopper bottom is agitated horizontally, and the sieves receive an elliptical motion.

Claim.—"What I claim as my invention, and desire to secure by letters patent, is the mode here described, of agitating the sieves by the use of the lever, and the hopper bottom by the use of the other lever,—both being attached to, and moved by the crank, the upper sieve partaking of the rotary motion of the crank, and the lower sieve

having a horizontal motion only; the whole being so arranged as to expose the falling grain or seed to a current of air, from the time it falls from the hopper till it reaches the screen."

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26. For an improved method of *Supporting the Spine of the Human Body;* Lyman Whiton, Troy, Rensselaer county, New York, October 12.

The braces that pass around the arms are designated in the claim by the letter F, these are attached to a piece B which is horizontally elastic and placed between the shoulders. A vertically elastic piece A, connects the piece B with another horizontally elastic piece C, to which the belt is attached, and from this latter piece, on each side, an elastic brace E, connects with each of the arm braces.

Claim.—"The upper or top piece I do not claim, nor the middle or centre piece horizontally elastic, nor the brace F; but I do claim the connecting of said top piece B, and said brace F with said horizontally elastic bottom piece C, and said middle piece A, elastic up and down, and down the back, and said elastic braces E E, operating as aforesaid, whether the supporter be made of india-rubber, or any other elastic material."

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27. For an improved *Air and Water Heater, for Steam Boilers;* Zenas C. Robbins, St. Louis, Missouri, October 16

This is for an arrangement of concentric tubes, forming three concentric departments. The waste steam, passing through the middle one, heats the supply of water on its passage through another of these departments to the boiler, and also the air for the blast, which passes through the third, on its way to the grate.

Claim.—"What I claim as new herein, and desire to secure by letters patent, is the combination and arrangement of the air, water, and steam chambers of my improved combined heater, in such a manner that the waste steam from a steam engine shall heat the supply water while passing through the heater on its way to the boiler furnishing said engine with steam; and the air required for combustion in the furnace of said boiler, in its passage through another portion of my improved combined heater, as herein described."

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28. For an improvement in the machine for *Sweeping Streets;* Alexander M. Wilson, Rossville, Richmond county, New York, October 16.

This machine consists of a set of curved brooms, that are moved around a shaft horizontally, and carry the dirt to one side of the street, and then rise up an inclined plane to deposit it in winrows.

Claim.—"Having thus fully described the nature of my improvements on the machine for sweeping streets, what I claim therein as new, and desire to secure by letters patent, is the manner in which I have formed and arranged the brooms, and combined them with the other parts of the apparatus, their stocks or heads being curved in the manner set forth, and the system of brooms being made to revolve

horizontally, and to deposit the dirt in regular rows, by raising them in a part of their circuit, as described; the general arrangement and operation of the respective parts of the machine being substantially the same with that herein fully made known."

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29. For improvements in the machine for *Knitting by Power;* Pierre Emanuel Ladrange, Vignory, France, October 16th; to run fourteen years from the 1st of June, 1843, the date of the French Patent.

This is for an entirely new arrangement of the mechanism around a central shaft, so that the machinery weaves or knits an entire circle without seam. The thread is carried continuously around, and the stitches or loops are formed one after another, in succession, around the entire circle.

Claim.—"Having now described the invention, and the manner of carrying the same into effect, it is scarcely necessary to point out to any one acquainted with the construction of machines, that the form and construction of this machine admit of considerable variation, and many of the operations may be performed by other mechanical devices; I therefore do not confine myself to the precise arrangement and construction of parts herein shown, nor do I claim the exclusive use of the several parts, except as hereinafter mentioned, unless the said several parts be used in the construction and working of a machine, as hereinbefore described, for producing knitted work or fabrics. But I do claim, 1stly, arranging the hook-billed needles, such as are used in the formation of stocking-net, and all other fabrics netted radially around a circular plate, or disk, or ring, as herein described; 2dly, I claim the sinkers in combination with the comb plate, provided with radial slots through which the sinks pass, and by which they are guided, as herein described; 3dly, I claim the disk in combination with the needles for closing the beaks of the needles preparatory to casting off the old loops over the points of the needles, as described; 4thly, I claim the arrangement of the cam pieces, to throw out the sinkers; and, in combination with these, I claim the pressing pieces and helical springs for forcing back the sinkers, as herein described; 5thly, I claim the method of working the sinkers up and down in the circles, by means of the undulating rib or rail in combination with the sinkers; 6thly, I also claim the combination together of all the elements enumerated in the foregoing claims, whereby I am enabled to knit continuously around a circle, as described."

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30. For a method of *Directing the Course of Aerostats or Balloons;* Muzio Muzzio, Bologna, Italy, October 16th, 1844; to run fourteen years from the 12th of May, 1842, the date of Letters Patent granted in France.

Claim.—"Having thus fully described the manner in which I construct and operate my balloon, or ærostat, I will remark, that I am aware that inclined planes have been applied to ærial machines for the purpose of enabling them to ascend by the resistance of the air;

it having been attempted to propel such machines by flapping instruments called wings, by revolving screws, by paddles, and by other similar means. I am also aware that machines thus attempted to be propelled have been furnished with jointed inclined planes, for the purpose of guiding them, in the manner of the tail of a bird; it is to be understood, therefore, that I do not claim as of my invention the mere application of inclined planes for the decomposition or resolution of the ascending and descending forces. But what I do claim as my invention, and desire to secure by letters patent, is the combination of inclined planes, substantially as herein described, with an aërial machine, or balloon, which is made to ascend and descend by a change in its specific gravity, as set forth; the ascending and descending forces decomposed or neutralized, and resolved into a horizontal one, or rather into a progressive line more or less inclined to the horizon, by the aid of atmospheric resistance; whereby the whole machine is impelled forward, and the direction changed at pleasure, by altering the inclination of the planes; the same being effected substantially as herein described. But it is to be distinctly understood that I do not limit my claim to the number or to the form of the inclined planes, or to the particular manner of operating them, or to the manner of obtaining an ascending and descending force, so long as the same is effected by a change of the specific gravity of the balloon, which, it will be evident, may be effected by the generation of hydrogen, as well as by its discharge."

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31. For an improved *Surgical Instrument called the "Uterinator;"* Daniel Gale, Boston, Massachusetts, October 16.

"This instrument is to be employed in the cure of chlorosis, amenorrhœa, menorrhagia difficulties, and in many uterine diseases; its object being to assist the surgeon in the introduction into the uterus of such injections as are generally used in the cure of such irregularities or disorders." It consists of a tube of silver, or other suitable metal, about nine inches in length, and in many respects resembling the instrument called a 'catheter.' One end of the said tube is rounded and pierced with small holes, and terminates in a small knob or button, and the other end is bell mouthed.

Claim.—"I do not claim the employment of a metallic or flexible tube in the operations necessary in uterine affections; but what I do claim, is my improved instrument, having a knob at one end, and an expanded mouth-piece at the other end, or being constructed without the said mouth-piece, but in other respects substantially as described —the same being for the purposes as hereinbefore specified."

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32. For an improvement in *Spinning Machinery;* Francis McCully, Jr., Paterson, Passaic county, New Jersey, October 19.

This improvement is fully expressed in the following—

Claim.—"What I claim as my invention and improvement, and desire to secure by letters patent, is giving to the bobbins the required rotary and traversing motion as herein described, by causing them to

rest on the peripheries of wheels arranged on a horizontal traversing shaft, whether applied to the cap frame, live spindle throttle, or other modes of spinning substantially the same, in which the bobbins receive rotating and traversing motions."

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33. For an improvement in the *Valves of Steam Engines;* Frederick Ellsworth Sickels, New York city, N. Y., October 19.

Claim.—"What I claim therein as new, and desire to secure by letters patent, is— 1st. My improvement in the periods of the movements of the valves, by which they are opened and closed relatively to each other, and to the movement of the piston; by means of which, the piston completes each stroke in equilibrio, or nearly so, without admitting steam against the movement of the piston, by a lead to the steam valve, which is effected, as before stated, by opening the lower exhaust-valve before the end of the upward stroke of the piston, and before the upper exhaust-valve is closed, and opening the upper exhaust-valve before the end of the downward stroke of the piston, and before the lower exhaust-valve is closed; the movement of the steam valves being so regulated as to admit steam to the cylinder only after the exhaust-valve on the corresponding end of the cylinder has been closed.

"I also claim as my next improvement, and as a means of carrying into effect my first and essential improvement, the arrangement of the toes on the rock-shaft, in such manner relatively to the location and form of the feet on the lifting rods, that at the middle, or nearly so, of the rocking motion of the rock-shaft, both lifting rods, with their exhaust-valves, shall be partly up, as herein described; and I also claim, in combination with this arrangement, the slip of the lifters on the steam-valve stems, as described, to insure the closing of the exhaust-valves before the opening of the steam-valves on the corresponding ends of the cylinder, as herein described."

Without drawings, the above improvements could not be more clearly pointed out than they are in the claim.

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34. For an improvement in the machine for *Harvesting Wheat and other kinds of small Grain;* George Esterly, Heart Prairie, Walworth county, Wisconsin, October 22.

This is for an improvement in that kind of machines by which the heads of the plants only are cut off, and the straw or stocks permitted to remain.

The box which receives the grain is supported on wheels, and is provided with a permanent knife in front, and a rotating reel with beaters which carry the heads of grain up against the permanent knife to cut them off. This reel is set in motion by a belt at each end that passes around a wheel on the carrying wheels of the machine, it being deemed important to have the reel of such length as to require a belt at each end, and as this would occasion difficulty in turning the machine, the reel is made in two parts, the shaft of one half being tubular to receive the solid shaft of the other. The axle-tree of the sup-

porting wheels works in adjustable boxes connected with the body of the machine so as to enable the operator to adjust the machine to the average height of the grain to be harvested, and in addition to this arrangement the body is connected with the horse frame at the axle-tree, and by means of a lever connecting the two, the attendant can adjust the cutter to the varying height of the grain in the field.

Claim.—"What I claim as my invention, and desire to secure by letters patent, is the mode of adapting the machine to different and varying heights of grain, by the combination of the adjustable boxes which connect the axle of the wheels with the receiver to which the cutters and reel are attached, in combination with the lever that connects the receiver with the horse-frame, as described.

"I also claim as my invention, and desire to secure by letters patent, making the reel in two independent parts, the shaft of one passing through the shaft of the other, so that they can turn with velocities corresponding with the velocities of the main wheels in turning curves of various degrees, as described, and removing the strain from the axle of the reel, cutters, and propelling gear, as herein set forth."

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35. For an improvement in the *Current Water Wheel;* J. D. Robinson, Peori, Illinois, October 24.

The buckets are each composed of several narrow strips attached to chains hinged to a cylinder, so formed as to permit them to fold in one direction but not to go beyond a line radiating from the centre of the cylinder to which they are jointed—when acted upon by the current, these buckets are thrown open, but so soon as they begin to make back water they fold on the periphery of the cylinder and prevent undue resistance.

Claim.—"Having thus described my invention, what I claim therein, and desire to secure by letters patent, is the combination of the cylinder and buckets, constructed and arranged in the manner and for the purpose above described."

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36. For improvements in the *Lathe for Turning Irregular Forms;* Edwin Tucker, Bucyrus, Crawford county, Ohio, October 24.

This is for a modification of Blanchard's well-known machine for turning irregular forms, in which the pattern and the piece of wood to be turned are put upon opposite sides of a rocking frame, and the pattern and cutter-wheel on a carriage that has but one motion from end to end. On the cutter carriage there is a rocking shaft, with a pattern wheel on one end, and a burr cutter on the other, to smooth or finish the work.

Claim.—"What I claim as my invention, and desire to secure by letters patent, is arranging the pattern on one set of arms of a tilting or vibrating frame, and the article to be turned or formed on another set, vibrating on the same centre, and with them, as herein described; the gearing for communicating motion to the pattern and mandrel being arranged at one end of the tilting or vibrating frmae, substantially as herein described. I also claim arranging the smoothing wheel and

small pattern or guide wheel, on different sets of arms vibrating together, and on the same centre, attached to the frame of, and traveling with, the reducing and main pattern wheels, as described; and this arrangement of the small smoothing and pattern wheels I claim, in combination of the pattern and article to be formed, as above described."

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37. For improvements in the *Method of Regulating the Draught of Stoves and Furnaces;* Joseph Saxton, and George Elliot, assigned to Harned & Elliot, Philadelphia, Pennsylvania, October 30.

In this stove, all the joints are made with the view to have them all air tight, as near as practicable, by luting or other known means.—The fuel is introduced through a hole in the top covered by a disk, having a flanch around it, and dipping into sand contained in an annular trough, or cup. The ash box, which is circular, is also provided with an annular cup containing sand, which, when borne up, receives a rim, or ring, surrounding the opening of the grate, and for the purpose of bearing up the ash box it rests on three circular inclined planes, which force it up when turned partially around; when let down it can be drawn out in the usual manner.

The air for feeding the fire is admitted through a small hole governed by a valve connected with a compensation bar attached to the stove. This compensation bar is composed of two metals of different expansibility, the most sensitive being placed next the stove, and the connexion between the bar and the valve is by means of a regulating screw—when the temperature is too great the bar expands, and permits the valve to close and cut off the supply of air, and when it contracts the valve is opened to admit air.

Claim.—"We do not claim the use of a compensation bar regulating the heat of the stoves; but what we do claim is the manner herein described, of combining with our stove, or any other substantially the same in principle, the compensating bar; the construction and arrangement being substantially the same as herein set forth.

"We also claim the manner of closing the draught by means of the combination of the ash-box, sand lute and inclined plane, in the manner herein set forth."

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38. For an improvement in the *Cooking Stove;* John W. Riggs, Fort Plain, Montgomery county, New York, October 30.

The main fire chamber of this stove is placed above the oven, in a manner will known to stove makers, the draught being admitted through an aperture in front, and near the top of the stove and descending to the bottom of the fire chamber, between the front plate of the stove and the front plate of the said fire chamber. This simply heats the top of the oven and such boilers as may be adapted to the top of the stove; and for the purpose of heating the front, bottom, and back of the oven there is an additional fire chamber placed in front, and on a level with the oven. The draught from this passes out from

the upper part of the back, descends between the back plate of this fire chamber and the front plate of the oven, under, and then up the back of the oven to the chimney. There is a space left between the front plates of the stove and oven, to prevent overheating the front of the oven. Another object of this additional fire chamber, we are told, is to combine in one a winter and summer stove.

Claim.—"I do not claim an extra stove or fire chamber, nor the construction of my main stove; but what I do claim as my invention, and desire to secure by letters patent, is the manner in which I have combined the extra fire box with the main stove; that is, there being between the fire box and the oven, three division plates, or two flue spaces, for the purpose above described—the main stove being constructed substantially as described, viz: having a fire chamber above the oven, and the flues and dampers arranged and operating as set forth."

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39. For an improvement in the *Self Setting Saw Mill;* Nathaniel P. Stearns, Linklaen, Chenango county, N. Y., October 30.

Without drawings we could not give a clearer notion of this improvement than will be found in the following.

Claim.—"I do not claim as my invention the combination of the right-angle lever with its jointed arm, and the trip-lever operated by the inclined bar to set the log, as this has been applied to set the tail end of the log, the levers being brought back to their appropriate position for a repetition of this action by a spring; but what I do claim as my invention, and desire to secure by letters patent, is reversing this arrangement in combination with the head block for a saw-mill carriage, so that the lever is brought back for a repetition of the action by the inclined bar, and the log is set by the spring the moment the lever is relieved from the inclined bar. I also claim the combination of the cog wheel, ratchet wheel, drum and axle operated by the rack on the side of the carriage, with the dogs, springs, cords, weights, pole and bar for opening and shutting the water-gate, in the manner and for the purpose set forth."

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40. For an improvement in *Ladies' Bonnets;* Thomas Hammond, New York city, N. Y., October 30.

Claim.—"What I claim as my invention, and desire to secure by letters patent, is the method herein described of making and forming bonnet-frames of steel or iron wire, case hardened, and so constructing it as to be purely elastic, so that when bent up to the shape of the bonnet, or flattened out, it retains its tension; also in hanging the crown by a small hinge to the back of the elastic frame; all of which is described in the specification.

List of American Patents which issued in the month of November, 1841, with Remarks and Exemplifications. *By* CHARLES M. KELLER, *Examiner of Patents.*

(Continued from Page 339.)

42. For a *Machine for crushing, corning, or graining, Gunpowder;* Leonard S. Swett, Canton, Hartford county, Ct., November 16.

The cake is first reduced by being passed between two fluted rollers that discharge it on to a screen, the meshes of which admit the particles sufficiently reduced to pass through, and conduct the rest to a second set of rollers that discharge it into a bolting reel, such as heretofore used.

Claim.—"I do not claim as my invention any several separate part of this machine, nor any particular shape, or size, in its construction, or any particular materials for its construction, any further than necessary to produce the desired effect. What I claim as my improvement, and for which alone I ask a patent, is the combination of the two sets of rollers, or cylinders, with said screen and said bolting reel, substantially as described."

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43. For an improvement in the mode of opening *Jaw Temples* used in weaving; Erastus Williams and Daniel L. Huntington, Norwich, New London county, Ct., November 16.

In the jaw temples heretofore used, the jaw does not begin to close until the lay runs back, but the present improvement is for so arranging a latch as to cause the jaws to close before the lay begins to run back, and thus cause them to catch the selvage of the cloth near the reed, where it is distended to its full width. To the front of the lay there is affixed a spring latch, the back of which is borne up against a regulating screw; the front part of this latch is an inclined plane, which, on the beating up of the lay, strikes against an inclined projection on the moving jaw of the temple, and opens the jaw, but at the end of the beat, this projection falls in behind the spring latch, which permits the temple to close and gripe the cloth, and on the return of the lay, the projection on the movable jaw opens the spring latch, that immediately falls back by the tension of the spring, to be prepared for the next beat of the lay.

Claim.—"What we claim as our invention, and desire to secure by letters patent, is the method of opening jaw temples of looms, by means of the jointed latch, whereby the temples are permitted to close before the return of the lathe, for the purpose and in the manner substantially as described."

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44. For an improvement in *Friction Boxes* for the journals of shafts; Martin C. Forrist, Foxborough, Norfolk county, Mass., November 16.

The box encloses three sets of rollers, which bear on the periphery of the journal and the inner periphery of the box. These rollers are

placed all around the journal, and act as truck rollers, and each set is one-third the length of the box. The two outside sets are connected together by small rods or rollers that pass freely through an aperture in each, and lie between, and separate, the rollers of the inner or middle set, which is also provided, in like manner, with small rods or rollers that pass through each one and project at each end sufficiently far to lie between and separate the rollers of the two outer sets.

Claim.—"I claim as my invention, arranging three sets of friction rollers about the journal of a shaft, or between the exterior of the journal and the interior of the box; and separating said rollers from each other by means of small rolls or rollers, having loose bearings in each of the two outer sets, the whole being constructed and operating substantially in the manner and for the purpose set forth."

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45. For improvements in the *Machine for Cutting Files;* Levi Anderson, Kensington, Philadelphia county, Pa., November 16.

The chisel or cutter is on the end of an arm so connected with its shaft as to be free to turn, that the cutting edge of the cutter may adapt itself to the face of the file; and for the purpose of lifting this chisel, a band passes around the arm and is hooked to a "hand" or lever operated by the tappet wheel. The striker is forced down by springs, the tension of which is regulated by a bar that slides on top of them, and the motion of the bar corresponds with the form of the file.

Claim.—"What I claim, is the manner of regulating the force of the blow by means of the varying length of the springs which bear upon the hammers, such variation in length being produced by the sliding bar, under an arrangement of parts substantially the same with that herein described. I also claim the manner of lifting the chisels by means of a band attached to the hand and arm in combination with the striker, as set forth."

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46. For improvements in *Chucks for Turning Lathes;* Sidney S. Hogle, Rushville, Ontario county, N. Y., November 16.

This, in common with the well-known universal chuck, has four sliding gripe pieces, which slide towards and from the centre of the plate in radial grooves, but instead of having one screw for each, there are two shafts crossing one another at right angles, there being a right and a left-handed screw on each, so that by the turning of each shaft, two gripes are made to approach towards or recede from each other, and thus the article to be chucked is griped by two instead of four operations. For the purpose of increasing the capacity of the chuck, separate griping pieces are put on to those above named, the latter fitting in a mortise in the former, and the two secured together by a screw.

And with the view to adapt this chuck to very thin articles, a gauge-plate is provided, which has small rods projecting from the back of it and sliding in holes made for that purpose in the face plate of the chuck, so that by means of screws, the gauge-plate can be secured at any desired distance from the ends of the gripes.

Claim.—"What I claim, is the manner of combining a right and left-handed screw on the same shaft, with two sliding pieces, so as to bring them up, and to hold firmly against any article which is to be turned or otherwise operated upon in the lathe. I also claim the manner of combining with the sliding pieces, what I have denominated gripes, clips, or holding pieces, by means of which, a chuck of small size may be made to receive and hold an article of any dimensions within the capacity of the lathe to which the chuck is fitted. I claim, also, the manner of combining the gauge with the chuck, so as to adapt it to the convenient holding of articles of various thicknesses, substantially in the manner set forth."

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47. For improvements in *Machinery employed in the manufacture of Elliptical Springs;* Wm. T. Richards, Poultney, Rutland county, Vt., November 16.

This is for forming by machinery the sockets required upon the ends of the upper springs to receive the lower springs, to form the joints.

Claim.—"What I claim, is the method described of forming the sockets of elliptical springs, by placing them upon the form and acting upon them by means of the shears for the purpose, and in the manner substantially as described. I also claim the clamp and gauge in combination with the form, for the purpose and in the manner described. And I further claim the shears in combination with the stocks, constructed and operating substantially as described, whereby the shears can be moved out of the way to enable the operator to get at the form."

The plate intended for a spring is secured to a bed, or form, by means of a clamp screw, and then shears are brought up from each side to trim the circular ends. The shears are attached to sliding stocks, one on each side of the form, and they are forced towards each other by two levers, operated by a treadle and toggle joint, and forced back by a weighted lever. The stocks that carry the shears work on journals below the line of the shears, so that they can be thrown back as well as slide lengthwise, to enable the workman to get at the form.

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48. For a *Machine for Mincing Blubber* on board of ships engaged in the whale fishery; George Kilburn and John J. Kilburn, Fall River, Bristol county, Mass., November 16.

This machine consists of a wheel, one face of which is at right angles with the shaft, and the other beveled towards the periphery. To the straight face of this wheel, a curved knife is attached, which extends from a little beyond the periphery to about midway between the periphery and the centre, and back of this knife the wheel is pierced with a beveled opening. The blubber is fed up to the cutter in a hopper, the bottom of which is a little below the range of the outer extremity of the knife, so that each slice that is cut, is not entirely severed from the mass.

Claim.—"We do not claim the knife on the wheel, or the opening

in the face of the wheel, nor the beveled edge of the wheel, as these have long since been known and used separately, as also the hopper; but what we do claim as our invention, and desire to secure by letters patent, is making the back face of the wheel beveled towards the periphery, and the beveled opening through which the blubber passes after it has been cut, in combination with the curved knife, and these thus combined in combination with the arrangement of the hopper, so that the part cut shall not be entirely severed from the mass in the hopper, substantially as specified.

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49. For an improvement in the *Washing Machine;* Leonard Proctor, Fultonville, Glen county, N. Y., November 16.

The clothes to be washed are put between cloths attached to one end of a tub, and passing over a roller at the other, and between these two points they are operated upon by two rollers attached to a vibrating frame. These rollers are pressed together by springs, to make pressure on the clothes as they vibrate from end to end, and this is increased by causing the clothes to pass over one of the rollers and under the other.

Claim.—"What I claim, is the combination of the elastic springs with the rollers, double cloth and vibrating frame, as applied to the washing of clothes and other articles of domestic use, by means of which, (viz: the springs) the rollers are allowed to diverge and converge, so as to adapt themselves to the inequalities of the clothes. I do not claim the principle by which the double cloth is made to pass above one roller and beneath the other, that being no part of my invention."

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50. For an improvement in *Pumps for raising water;* Joel Farnam, Stillwater, Saratoga county, N. Y., November 16.

Claim.—"What I claim, is combining the receiving and discharging cups with each other and with the cylinder, by means of a double chamber connected by trunks with the cylinder—that is to say, connecting the pump with a chamber around the outside of the cylinder, divided by partitions, said chamber communicating with the receiving and discharging cups, and also with the cylinder at either end by two tubes or trunks formed in arms or projections cast on the under side of the cylinder, one on the solid end of the cylinder on the right of the lower partition, and the other next the end of the cylinder, closed by the screw cup, on the left of the said partition, both being for the purpose of conducting the water to and from the cylinder through chambers, at the alternate backward and forward stroke of the piston, as described."

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51. For improvements in the *Furnace for Heating Buildings;* Matthew Stewart, Jr., Philadelphia, Pa., November 16.

This furnace is provided with a central fire-chamber, and hot-air chambers surrounding it; and the first improvement claimed is for lining the interior with thin vertical plates, bent at right angles, form-

ing spaces between said plates and the cylinder. Over the sides of these plates, towards the centre of the cylinder, are arranged a series of oblique ribs, for preventing the fuel from becoming packed in a solid mass against said plates, and also from burning out rapidly; and the plates are for preventing the same effect on the cylinder, columns of smoke and other gas being kept circulating between the plates and the other cylinder, which ascend to the chimney. The other improvement claimed is fully expressed in the claim.

Claim.—"What I claim, is, first, the construction of the furnace with the lining of thin bent plates, for the purpose and in the manner set forth; secondly, the method of constructing and combining the water vessel with the hot-air chamber, by forming it with a projection and arranging it immediately over said chamber, with the tube for conducting off the smoke passing through the opening in its centre, as described."

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52. For improvements in the *Machine for Sawing Staves;* Robert Stewart, Michigan City, Laporte county, Ia., November 25.

The patentee says—"My machine is of that kind in which the saw is made in the form of a hoop, which has teeth upon one of its edges." The improvements are fully expressed in the

Claim.—"What I claim, is, first, the manner of driving the saw by means of the strap or band on its outside, in combination with the arrangement for driving it by means of the friction wheels in the interior, as set forth; and, secondly, the manner of keeping the hoop saw up to its bearing on the back plate, or flanch of the friction wheels, by placing the shafts of the said friction wheels out of parallelism with the axis of the saw as set forth."

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53. For an improvement in the *Machine for Ginning, Burring or Cleaning Wool and Cotton;* Francis A. Calvert, Lowell, Mass., November 25.

The patentee says—"The general principle upon which this machine operates is the same with that invented and applied to the same purpose by Wm. W. Calvert and Alanson Crane; and like it, the principal difference between it and some other machines which have been heretofore employed for burring and cleaning wool and cotton, consists in substituting for the knife or guard formerly used to arrest and separate the burs, seeds, and other foreign matter from the animal or vegetable fibres to be cleaned, an apparatus which shall operate upon such fibres in a manner analogous to that of picking out such foreign matter by hand. But instead of projecting edges of a revolving fluted or channeled roller to strike against the burs and other foreign matter, as in Calvert and Crane's machine, I employ what I denominate an angular toothed guard, which is made of sheet metal, which has openings or slots between each of its teeth, into which openings or slots, the pointed wires, or teeth, of a revolving cylinder, or roller, which I denominate the intersecting toothed cylinder, or roller, passes as said cylinder is made to revolve; the intention of this combined apparatus be-

ing the same with that of the revolving fluted or channeled cylinder in Calvert and Crane's machine."

Claim.—"What I claim, is the manner in which I have constructed what I have denominated the angular toothed guard, and combined the same with the revolving intersecting toothed cylinder, the angular toothed guard lying upon the fine comb cylinder and separating the burs and other foreign matter by the action of the oblique edges of its teeth, and much foreign matter being finally beaten off by the revolving intersecting teeth of the cylinder, as set forth; the respective parts being made, adjusted, and being constructed and operating substantially in the manner described."

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54. For a *Governor or Regulator for Machinery;* Louis Lizé, a citizen of France, residing in Pittsburg, Pa., November 25.

This is a substitute for the well-known centrifugal governor, or the hydraulic governor, and consists of the employment of two bellows pumps, which force air into a receiver, the upper part of which is movable and connected with the steam engine or other machine to be regulated, so that when the quantity of air forced in is too great for the capacity of the discharging aperture, it is forced up and arrests the supply of steam, if applied to a steam engine, or of water, if applied to a water wheel.

As the claim refers to and is dependent upon the drawings, we are under the necessity of omitting it.

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55. For an improvement in *Shutes for directing the discharge of Water on to Water Wheels;* Ira Stanbrough, Arcadia, Wayne county, N. Y., November 25.

This improvement is applicable to the tub wheel and other wheels to which the water is applied in the same way.

Claim.—"I do not claim as my invention, the employment of a series of spouts at the bottom of the flume, for admitting water to the buckets of the wheel, nor do I claim constructing these spouts in a separate plate, constituting the bottom of the flume; but what I do claim as my invention, and for which I desire to procure letters patent, is combining a movable plate or system of spouts with the floor of the flume, which is separate, and detached from said plate or system of spouts, and having apertures for the passage of the water to the buckets of the wheel, which plate or system of spouts can be removed when necessary to take out or repair the wheel, and can again be put down in its proper place without taking up or injuring the flume or the floor thereof, and without separating the spouts from each other, as described and set forth."

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56. For an improvement in *Door Latches;* James M. Hoggan, New Haven, Ct., November 25.

This is for an improvement on that kind of mortise latch in which the bolt is thrown back by turning the knobs either to the right or left, the projections or levers on the spindle being located within an

opening in the body of the bolt, and acting on the back face thereof. The alleged objection to the old plan, which it is the object of the present modification to remove, is the small extent of motion given to the bolt, or if not this, the great width required to be given to the opening in the bolt to receive levers or projections on the spindle of sufficient length to give the required motion to the bolt. To remedy this defect, four cogs are made on the spindle above, two above and two below, and one above and one below in the space or opening in the bolt. The first cog above and below on the spindle are on the same plane, and act against the back face of the opening in the bolt, and the other two are on a plane further back and act on the cogs of the bolt. This arrangement of the cogs is necessary to admit of pushing back the bolt by turning the knobs in either direction, for when the upper cogs are in action, the lower cogs pass by each other, and vice versa, which would not be the case if all the cogs were on the same plane. Another improvement is for adopting the spindle to doors of various thicknesses, by tapping the spindle for the reception of the knobs, which screw on, and providing a slot at each end, instead of a hole, for the securing pin.

Claim.—"What I claim, is the formation of the rim of the bolt with cogs therein, in combination with the arrangement of cogs on the segment or half pinion, for the purpose and in the manner described. I also claim the combination of the screw attachment of the knobs and segment, or knob, with the slots in the ends of the said shaft, for the purpose of accommodating the space between the knobs to any thickness of doors, as described."

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57. For improvements in *Self-acting Rotary Temples for Looms*; Wm. Craig and John Cochrane, England, November 25.

Claim.—"We shall claim the method of constructing the self-acting rotary temple so as to have the cloth pass over and in contact with the upper surface of the wheel, instead of a plate below which the wheel was placed, as heretofore made, so that the selvage shall, in a great degree, be supported on the circular edge or junction of the faces of the flanch and wheel, by having the wheel of pins revolve on an arbor projecting from the box, as described. We do not wish to be understood as making claim simply to this mode of working a wheel on an arbor, as it is a well-known device, but to limit our claim to it when employed in temples of the above construction, and in the manner and combination set forth. We also claim the projection on the exterior of the wheel-box, formed as described, and situated immediately in rear of the front opening in its circumference, and through which opening the cloth is introduced to the wheel, the same being for the purpose of guiding the selvage, or turning it downwards at the proper angle, to be received on the points, as the wheel is revolved, in the process of weaving."

ENGLISH PATENTS.

Specification of a Patent granted to JOHN LIONEL HOOD, *of the city of London, for an improved composition or mixture of metals, applicable to the manufacture of sheathing for ships and other vessels, bolts, nails, or other fastenings,—being a communication.*—[Sealed 17th February, 1844.]

This invention consists in certain mixtures of copper, zinc, and lead, with or without the addition of a small proportion of antimony, tin, or iron, and in which mixture the copper exists in various proportions, up to 50 per cent.; the object being, to produce a compound which is capable of being rolled out into sheets, suitable for the purposes to which copper sheathing has hitherto been applied; and also for forming ships' bolts, nails, and other fastenings. The addition of a third or fourth metal to the ordinary ingredients of brass, (which are copper, and zinc,) is for the purpose of altering the crystaline arrangement of the particles of the metallic compound, or brass metal, to enable the manufacturer to roll the same into sheets with a smaller proportion of copper than has hitherto been practised (by which means a much cheaper sheathing is produced than sheet copper, or the sheathing hitherto known as yellow metal,) and also to form a compound which is capable of wearing well, yet containing a sufficient proportion of copper to render the surface of the plates susceptible of oxidation at sea, and thereby poisonous, by the formation of the cupreous salts, so as to resist the attack and adhesion of barnacles and other marine animals, which would otherwise impede the rate of the ship's sailing.

The mixtures here chosen are in such proportion as to combine chemically, or in atomic ratio, taking the prime equivalent, copper, at 32, according to the authority of the late Dr. E. Turner, Professor of Chemistry at the University of London.

As an example of the requisite proportions to embody these conditions, the following compounds are given, in which the copper ranges from 40 to 50 per cent.:—

	Atoms.		per cent.
Copper	16	or	40.4
Zinc	15	"	38.0
Lead	2	"	16.5
Antimony	1	"	5.1
			100.0

	Atoms.		per cent.
Copper	16	or	41.0
Zinc	15	"	38.0
Lead	2	"	16.5
Tin	1	"	4.5
			100.0

Copper	8	or	41.4
Zinc	8	"	41.4
Lead	1	"	17.2
			100.0

Copper	12	or	44.0
Zinc	12	"	44.0
Lead	1	"	12.0
			100.0

	Atoms.		per cent.		Atoms.		per cent.
Copper	10	or	43.0	Copper	14	or	44.8
Zinc	10	"	43.0	Zinc	14	"	44.8
Lead	1	"	14.0	Lead	1	"	10.4
			100.0				100.0
Copper	8	or	43.8	Copper	16	or	45.4
Zinc	7	"	38.3	Zinc	16	"	45.4
Lead	1	"	17.9	Lead	1	"	9.2
			100.0				100.0
Copper	32	or	45.5	Copper	32	or	46.5
Zinc	30	"	42.5	Zinc	32	"	46.5
Lead	2	"	9.0	Lead	1	"	4.7
Antimony	1	"	3.0	Tin	1	"	2.3
			100.0				100.0
Copper	10	or	46.0	Copper	8	or	46.0
Zinc	5	"	24.0	Zinc	6	"	35.0
Lead	2	"	30.0	Lead	1	"	19.0
			100.0				100.0
Copper	5	or	49.0	Copper	8	or	49.0
Zinc	2	"	19.5	Zinc	5	"	32.0
Lead	1	"	31.5	Lead	1	"	19.0
			100.0				100.0

Iron may also be employed, by forming a mixture in which 1 atom or 28 parts of the pure metal, are combined with any given number of atoms (or equivalents) of copper, the zinc being also employed in atomic ratio.

The foregoing mixtures are given merely as examples for the formation of metallic compounds, of different densities, to be employed in the construction of rods, bolts, nails, sheets, and other similar articles, suitable for marine and other purposes; but the patentee does not confine himself thereto, so long as the mixture is in definite proportions, atomic ratio, or chemical equivalents, and forming a compound in which the copper ranges in proportion, not exceeding 50 per cent. by weight; such proportions forming an economical and useful mixture for the manufacture of marine sheathing, rods, bolts, nails, and other fastenings, the same not having been hitherto used and employed for such purposes.

The best mode of manufacturing is,—first to melt the copper in any suitable furnace, and, when completely fused, to add the zinc, lead, and other metals (if others are employed,) in small quantities at a

time, so as to avoid "setting" or cooling down the copper below the point of fusion; waiting a sufficient time between each addition to allow the proportion last added to become properly melted and incorporated, and taking care to prevent, as much as possible, the loss of the zinc by volatilization; which object is usually effected by holding each plate, or ingot, of zinc down below the surface of the copper, by means of a wooden pole or iron tool, till it is completely melted, as is well known to the workmen employed in making brass and yellow metal.

Or the entire quantity of copper may be first melted, and the lead, or other metal, then added. When the mixture is sufficiently fluid, a wooden pole should be introduced into the melted metal, and the mixture stirred well, the pole being allowed to burn, so as to liberate the hydrogenous gases from the wood, similar to the modes generally adopted in "poling" copper, when refining that metal. A portion of charcoal may likewise be thrown on the surface of the melted metal, to prevent loss by oxidation; the same being regulated by the practical experience of the founder, who should be well acquainted with the usual modes of refining copper and other metals. When this is done, the zinc or spelter should be added, in the way previously pointed out, to avoid chilling the metal too much; and when the whole is properly fused, the charge should be "tapped" or "laded" out of the furnace without delay, into iron or other suitable moulds, to form plates of from one to two inches in thickness, which should be allowed to get cold, and then separated from the moulds, and brought to a red heat, in a suitable furnace. The plates must be then passed between the rolling cylinders to reduce them to the required thickness—stopping the rolling as the metal chills below the point of redness; and reheating it as often as it is found necessary; or the plates when reduced to about $\frac{1}{8}$th inch thickness may be rolled cold,—taking the usual precaution of annealing them in the furnace after every two or three times passing between the cylinders.

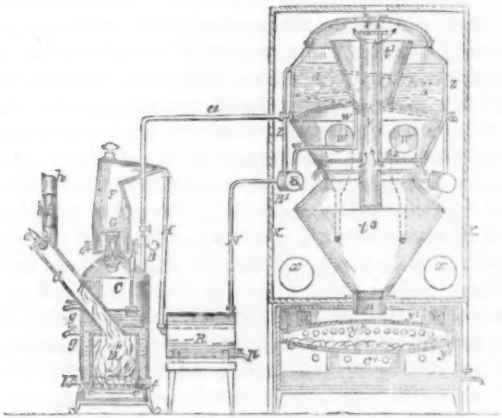
The furnaces and machinery may be such as those ordinarily employed in melting and rolling copper and brass, which are well known, and therefore require no particular description.

The patentee does not confine himself to the precise proportions herein set forth; but he claims the manufacturing of sheathing, rods, bolts, nails, and other fastenings, for marine and other purposes, from mixtures of the above-mentioned metals, in atomic ratio, in which the copper does not exceed the proportion of 50 per cent., as above described.—[Enrolled August, 1844.] Lond. Journ. Arts & Sciences.

Extract from the Specification of a Patent granted to Charles Clark, *of the city of London, for his invention of an improved pyro-hydro-pneumatic apparatus, or means of generating, purifying, and condensing steam and other vapours.*—[Sealed 31st January, 1843.]

This improved apparatus is shewn in the annexed figure as appli-

cable to converting sea-water, or any other water holding saline and other solid matters in solution, into fresh water. A, is the supply cistern, which communicates by a pipe *a*, with a self-regulating induction apparatus B, on what is known as "Hamer's plan." C, is a strong wrought-iron cylinder, fitted at bottom into a flanched ring-plate *c*, and covered with a conical top; it is about two-thirds filled with the water to be operated upon. D, is a cylindrical furnace, concentric with the



water cylinder C; *d*, is an upward air and water-tight tube, which serves both as a feed-pipe, through which the fuel is supplied to the furnace, and as a passage for the escape of the smoke and other gaseous products of combustion; *e*, is a hinged trap-door, through which the fuel is passed into the tube *d*; *h*, is a chimney, in which the pipe *d*, terminates; and *i*, a damper, by which the degree of activity given to the furnace can be regulated at pleasure; *f*, is an open air-pipe, which leads from the outside, through the boiler, into the furnace, a little way above the fire-bars, and assists in securing a good draught through the furnace to the chimney. To the water cylinder C, there are attached gauge-cocks *g*, *g*, for ascertaining, from time to time, the height of the water; *l*, is a cock or tap, for drawing off the brine and other residual matters, which collect at the bottom of the boiler; *m*, is a screw-tap hand-hole, through which access may be had to the interior of the water-cylinder C, when it is required to be cleaned; E, is a short pipe fitted into the conical top of the water-cylinder C, and conveys the steam, generated in that cylinder, into the steam-head or receiver F; G, is a concave plate, resting upon the top of the pipe E, and is a little larger than the pipe, but is kept steady by a weight *k*, of one, two, or more pounds, (as may be found expedient) suspended from it by wires. The purpose of the plate or cap G, is to prevent, in a great measure, if not entirely, any water from escaping into the steam head; (producing the injurious effect commonly called priming) because, until the steam has acquired a pressure exceeding that of the counterweight *k*, it cannot raise the cap G, so as to escape freely into

the steam-head F; because any watery particles which may remain still intermixed with it, must, in the interval, or during the rising of the cap G, strike against it, and drop back, either into the water-cylinder C, through the pipe E, or into the space around that pipe at the bottom of the steam-head F; from which latter place, it may be withdrawn by the cock shewn in the drawing;—H, is a pipe, which conveys the steam from the steam-head F, to the rectifier R. The rectifier R, into which the steam passes from the water-cylinder C, consists simply of a cylinder, about one-third the size of the cylinder C, set in a horizontal position. In the lower part of this cylinder a body of water speedily collects, from a partial condensation of the steam, on its first admission; and the water, thus produced, serves afterwards to attract and retain any particles of undecomposed matter, which may come over with the steam, which continues to flow in from the boiler; so that the purer portions, only, of the steam may pass off from the rectifier R, by the pipe N. *n*, is a cock or tap, at the bottom of the cylinder R, for drawing off, occasionally, the water which accumulates therein; R^1, is a second steam rectifier, similar in constructon to R, into which the steam passes from the pipe N, and is thereby still further purified.

In some cases, where the quantity of saline and other matters, held in solution, is comparatively small, this second rectifier may be dispensed with; or, in others, where the water is more than commonly brackish or foul, a third or fourth rectifier, on the same plan, may be added. The condenser, for liquifying the purified steam, and aerating the resulting water, is shewn at l^1, l^2, l^3, and is composed of conical chambers or compartments, placed perpendicularly, and communicating with each other; the chamber l^1, is surrounded by the water in the cistern A, (which becomes partially heated by the steam in the chamber l^1,) and the chambers l^2, l^3, the two latter of which are exposed to the external air. The lowest chamber l^3, terminates at bottom in a tube *u*, containing, at the mouth of the cone, two or three plates of perforated zinc, through which the external air is admitted. A steam and water-tight perpendicular tube *v*, (of zinc, or other equally pure metal) is inserted at about the middle of the lowest chamber l^3, and continued to the top of the uppermost chamber l^1, and has two lateral branches. The lower end of this tube is closed; but at the top, as also at the ends of the lateral branches, it is open, for the absorption of air by the heat in the tube, and the consequent accelerated escape of the heated air at the top of the tube. W, W, are pipes, which pass externally from about the middle of the chamber l^2, to near the bottom of the chamber l^3, and at the top are of the large size represented in the drawings, but diminish gradually to pipes of a very small diameter at bottom. Of these pipes, there should be as many as can be conveniently applied, in order that the process of condensation may be effectually promoted.

From the second rectifier R^1, the steam is conveyed by a pipe *w*, of gradually enlarged dimensions, to near the top of the middle chamber l^2, whence it diffuses itself throughout the three chambers, and becomes condensed by the various cooling influences to which it is

there exposed. The hottest steam of course finds its way into the chamber t^1, where it encounters the greatest amount of heat absorbing means which the apparatus furnishes for the purpose of condensation. The main body of the water, resulting from the condensed steam, either drops directly down to the bottom of the chamber t^3, or runs down the inclined sides of the chambers t^1, t^2, and t^3 and through the external pipes w, w, and out at the bottom tube, being partially aerated in its course, so far, by the air constantly ascending through the tube *u*.

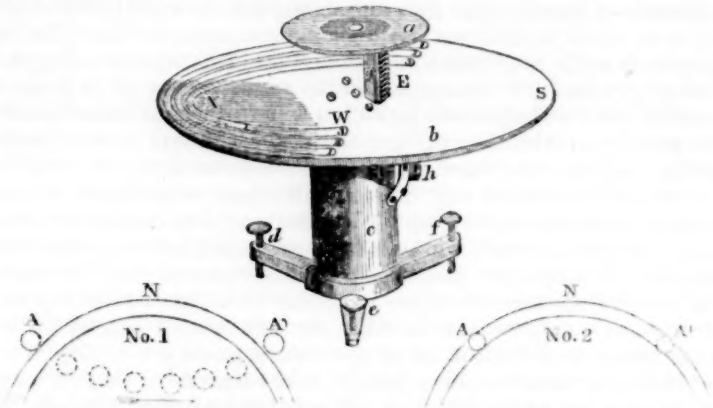
When an apparatus, constructed as above described, does not give a sufficiently abundant or rapid yield, its efficacy may be increased, by carrying an auxiliary steam-pipe z, z, from the rectifier R¹, round the outside of the water supply-cistern A, and in close contact therewith, for one, two, or more coils, terminating in a cylinder which communicates, by pipes, with the chambers t^2, and t^3, so that all the water, resulting from the steam condensed therein, may be precipitated through the perforated zinc plates into the general discharge tube *u*. x, is an outer casing of wood or metal, which encloses the condenser,—a small space in width being left all round, and draft-holes *x*, *x*, made in different parts for the admission of air. The refrigerator is made of protected metal, and divided into three compartments y^1, y^2, and y^3. In the top of the compartment y^1, is inserted the end of the discharge-tube *u*; and at a little distance from this tube there are air apertures a^*, a^*, which have shutters on the inside, slanting from the top downwards, to prevent, as much as possible, the escape, outwards, of any vapor which may occasionally be carried down with the water from the condenser. The middle compartment y^2, which is pierced with air-holes all round, is of a convex form at top, and of a concave form (inside) at bottom; so that the water, which drops from the tube *u*, on to the centre of the convex top surface of y^2, falls off towards the sides, through small pipes, which admit the water into the interior of the compartment y^2; while, on the other hand, the concave form (inside) of the bottom of that compartment, causes the water, when it arrives there, to flow towards the centre, where there is a filtering-box c^*, which projects a little way downwards into the lower compartment y^3, placed to receive it. For the purpose of breaking up the water, and thereby the better aerating it, the bottom of the compartment y^2, is covered, about an inch deep, with small pebbles, through which the water percolates towards the filter. The lower compartment y^3, which serves for the final reservoir of the purified and cooled water, is perforated with air-holes.—c^1, c^1, are small pipes, which serve to promote the continual flow upwards of external air. The compartment y^3, is furnished with a tap, by which the water is drawn off, as required.* Ibid.

* The remainder of this Patent is for Modifications for Rectifying Spirituous Liquids, and Extracting the soluble portions of vegetable substances.—Com. Pub.

The Orthochronograph.

[Registered under the Act for the Protection of Articles of Utility.]

At a late meeting of the British Association, Dr. Robinson exhibited and explained the Orthochronograph, an ingenious instrument recently introduced by Messrs. Webster & Son, the eminent chronometer manufacturers, of Cornhill, London. The Orthochronograph effectually accomplishes the object in view, the ascertaining of correct time. Its property is derived from the intersection of a curvilinear line at two points by the circular transit of a solar ray. The instrument consists of two horizontal circular plates, parallel to each other. The upper one, *a*, has an aperture for the passage of a solar ray; the lower one, *b*, has three pair of semicircular lines, for the purpose of making observations. The lower plate, *b*, is supported by a pillar, *c*, resting on a tripod, furnished with three adjusting screws, *d*, *e*, *f*. The upper plate *a* is raised or lowered by means of a rack *g*, working out of the pillar *c*, by means of a pinion and friction rollers, acted upon by the milled head *h*.



For taking an observation, place the instrument upon any firm support, with the letters N and S as nearly north and south as may be; but rigid accuracy in this respect is by no means essential. By means of a spirit level and the adjusting screws *d e f*, bring the plate *b* into a horizontal position; then raise or lower the plate *a*, until the sun's ray is in contact with the line on which it is intended to make the observation, as at A in the diagram, No. 1, or until the ray appears within the double line as at A, No. 2. In either case note the hour, minute, and second, when the ray is at A; leaving the instrument undisturbed the sun's ray will traverse the plate in the direction of the arrow until it arrives at the point A', when the time is again to be accurately noted. Add the results of the two observations together, and divide by 2; the difference between this result and 12 hours will show the error of the clock as compared with solar time, which being corrected by the necessary equations (of which very complete tables are given in the descriptive pamphlet which accompanies the

instrument) gives the desired result. For example an observation is taken outside the line, (No. 1,) on the 21st December, 1843.

	h.	m.	s.	
1st Observation A,	8	58	15	
2nd do. A′,	14	52	24*	
	2)23	50	39	
	11	55	19	
	12	0	0	
	0	4	41	too slow.
Equation of time,	0	1	51	slow.
Clock really too slow,	0	2	50	

The interval between the two observations will depend on the time when the first is made; it is better not to be less than three hours; the first observation, therefore, should not be later than ½ past 10 a. m.

The Orthochronograph is at once cheap, portable, and simple in its construction and use, not liable to be deranged, and may be used in any part of the world by the most unpractised hand; while the result of the observation requires only the operation of addition or subtraction to give true time.

To country clergymen, watchmakers, and persons having the care of public clocks, such an instrument is almost indispensable; to the lover of mechanics or the mathematician it will afford the pleasure which always arises from a new application of natural phenomena to practical purposes; while the mariner will find it serviceable, when, on making the land, he wishes to test the accuracy of his chronometer.

Lond. Mechanics' Mag.

Specification of a Patent granted to Henry Heighton, *of Rugby, for "certain Improvements in electric telegraphs."*—Granted July 10, 1844; Enrolled Jan. 10, 1845.

The object of the invention is to adapt a system of telegraphing to common or frictional electricity. For this purpose the inventor uses an Armstrong's hydro-electric or other powerful electric machine, and with it charges a Leyden battery. He employs an instrument, different modifications of which are described in the specification, and which regulates the number of discharges sent, the intervals of time at which they are sent, and the nature of the discharge, that is to say, positive or negative. He shows that in 10 discharges any one of a number of more than 16,000 signals may be made, or in 30 discharges any one of more than 1000 millions if necessary.

The method of observing the signals at the place to which they are

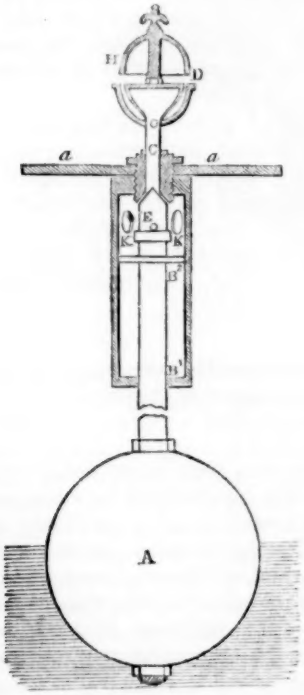
* The hours after noon are reckoned as 13, 14, 15 &c., and not as 1, 2, 3 o'clock, &c.

sent is by means of two wires, the one communicating with the place from which the signals are made and the other with the earth, which are placed perpendicularly to a sheet of paper or similar substance, which is moved along by clock work, so that each discharge shall pass over the surface and through the substance of the paper, making a hole close to the wire from which the negative electricity proceeds. This paper is colored with chromate of lead, which is easily decomposed by the electric spark, and moistened, if necessary, with sulphuric acid to facilitate the passage of the spark. Thus the sparks leave on the paper a kind of printed register of the signals which have been made. Other methods of observing and registering the signals are described, where the electricity, after having traversed a great distance, is too weak to produce the effects just described.

Civ. Eng. & Arc. Journ.

Allen's Anti-Explosive Alarm Whistle.

Registered under the Act for the Protection of Articles of Utility.—Job Allen, Engineer, Proprietor.



The object of this instrument is to prevent injury to boilers from the water falling below its proper level.

A is a float attached to a stem or rod, which passes upwards through a tube, B^1, and a diaphragm, B^2, fixed within that tube, and terminates in a conical top, which fits into the hollow pipe, C, of the steam whistle D. The lower end of the whistle D is passed through an orifice in the top of the boiler (indicated by the letters *a a*,) and screwed into the top of the tube, which is thus kept steady, if in a vertical position. E is a collar attached to the stem of the float, near the top, which, catching against the plate B^2, on the fall of the stem or rod A, prevents it from descending further. When the water falls below the safety line, and the float along with it, the descent of the stem of the float opens the pipe C of the whistle, and allows the steam to escape, which, impinging against the bell H at top, produces the alarm required. K K are orifices in the side of the tube to facilitate the rushing of the steam into the whistle, as soon as the boiler is in danger.

Lond. Mechanics' Mag.

Specification of a Patent granted to EDWARD JOHN DENT, *of the Strand, London, chronometer maker, for Improvements in Ships' Compasses.*—Granted July 30, 1844; Enrolled Jan. 30, 1845.

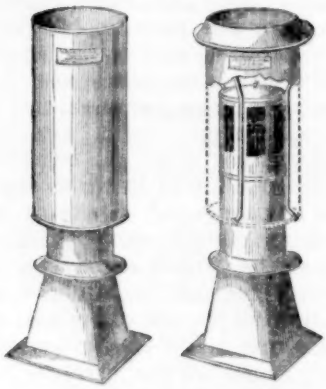
Amongst the evils arising from the present construction of compasses are the following:—1st. The friction arising from the imperfect mode of suspension; which is that of a hollow cup in the centre of the needle, resting upon a steel point; in which case it is obvious that a want of horizontality in the card will cause considerable friction between the convex sides of the pivot and the sides of the cup. 2ndly. A considerable error is caused by the assumption, that the *magnetic axis* of the needle coincides with what is called the *maker's axis*, which is the line determined by the marks or zero points on the extremities of the needle; which error in flat needles, such as are usually applied to compass-cards, is frequently of such magnitude as to be quite inadmissable, even in compasses for common purposes, much less for those intended for accurate experiment. 3rdly. Another source of inconvenience and inaccuracy arises from the unequal amount of inertia as regards the axis, or horizontal line drawn through the centre of the card, about which line it is compelled to vibrate or deviate from its horizontal position by means of the alternate pitching and rolling of the vessel. However well the gymbal apparatus, in which the card is placed, is balanced, yet as the card has a motion or time of vibration to itself, depending upon the position of the axis of its vertical vibrations with respect to the axis of the needle—which vibrations are not altogether under the control of the gymbals although its vibrations are continually checked, and its quiescence disturbed by it in consequence of the supporting pin coming in contact with the sides of the cup, as before mentioned--yet in the construction of the binnacle compass, the card ever will be subject to irregular deviations from the horizontal plane, arising from this cause.

The mode by which the inventor has removed these evils has been by altering the nature of the suspension; that is, by suspending the card in a similar way to the balance of a chronometer, and with equal delicacy, both ends of the pivot acting on diamonds, and the holes jewelled, by which means the card is constrained to move very nearly in the horizontal plane, since in this respect it is entirely under the control of the gymbals. The friction is also considerably reduced by this mode of suspension. The great accuracy with which the card returns to the same position has been clearly shown by a great number of experiments. To remove the error arising from the nonagreement of the *marked* or *maker's* with the *magnetic axis*, a simple contrivance is effected for the *inversion of the card*, so that either side of it may be placed *above* or *below*. Since the marked axis of the needle is in each of these positions at equal distances from, but on opposite sides of the magnetic meridian, a mean of an equal number of observations in both positions of the card will evidently eliminate any error of this nature, and give the true magnetic azimuth of the observed object, *at the time of observation*, by an equal compen-

sation of error. It it also plain that the constant adjustment required to make a delicate needle horizontal in different magnetic latitudes is rendered thus unnecessary. Lond. Civ. Eng. and Arch. Journ.

The Himalaya Funnel, for the Cure of Smoky Chimneys, Registered pursuant to Act of Parliament, 6 & 7 Vic. c. 65. Sole Proprietors, James Boyd and Son, 78, Welbeck Street, Cavendish Square, London.

Fig 1. Fig 2.



The principle upon which this apparatus is constructed, is that of conducting the smoke through apertures in the sides of the chimney shaft, into an outer case of considerable length, which extends above the top of the chimney, and is open both at the top and bottom, the chimney shaft itself being perfectly closed at the top. A current of air thus passes vertically through the outer case; and, in conformity with an established law, both of pneumatics and hydraulics, that when two currents of fluid matter passing in the same direction, but in separate channels, arrive at any point of confluence, the stronger current draws along in its course, and with a considerable portion of its own velocity, the weaker current: so the force of the wind, which checks in other instances the action of a chimney draught, in this is made to produce a stronger draught exactly in proportion to the violence with which it blows. Whether the wind blows *upwards* or *downwards* through the outer case the effect is the same, as the chimney shaft is closed at the top. The Himalaya Funnel thus becomes a perfect wind guard, equally applicable for increasing the draught, whether exposed to horizontal or vertical currents of wind; and will therefore remedy the largest class of smoky chimneys, which are those arising from high winds and *downward currents*, produced by adjacent buildings of greater elevation, or by any other *external* cause; and for all such defects it must be an infallible remedy. The conical projection upon the funnel a few inches below the exterior case (see Engravings) is intended to increase the effect of horizontal currents of air, by deflecting them upwards between the funnel and the exterior case, at the same angle at which they strike upon the said projection, and thereby assist the efflux of the smoke; but no air passes into the *interior* funnel, either at the conical projection or elsewhere. And in order still further to increase the effect of horizontal currents of air, the conical projection on the top edge of the outer case (fig. 2) may also be used when required.

The Funnel may be constructed of zinc, iron, or other metals. It is extremely simple—not liable to derangement—is readily swept by the ordinary machine—effectually excludes rain—and being perfectly devoid of machinery, it possesses great advantages over all revolving chimney tops or cowls, which are liable to continual derangement by their exposure to the weather. Ibid.

MECHANICS, PHYSICS, AND CHEMISTRY.

On Elkington's Process of Coating Iron with Zinc, Copper, &c.—*By* F. Pellatt.

Our present object is to detail the method of protecting iron by coating it with other metals, by means of depositing them from their solutions by an electric current. Iron, from its strength and cheapness, is perhaps the most valuable of all metals, and its application is now universal; it seems as essential to the convenience of man as air or water to his physical wants. The abundant supply of the mineral ore, in connexion with coal, the necessary agent for making it useful, has done much to raise our country to the high standard of political importance it now enjoys among nations. Valuable, however, as this metal is, it has this drawback, that it is subject to decay under almost every circumstance in which it can be placed, from its strong affinity for oxygen; and, as this agent is present in air, earth, and water, iron is ever liable to be acted upon by this destructive element.

Combining with oxygen, iron becomes what we term rusted, and so insinuating and destructive is this agent, that no sooner is one layer of oxide formed than another begins and undermines it, and so on till the iron is completely corroded.

Seeing how susceptible this metal is of deterioration and decay, it might be thought that much attention had been paid to secure some mode of protecting it, but this has not been the case, probably owing to the extreme cheapness of iron, rendering it necessary that the protecting coating should have, not only the property of indestructibility, but should not add much to the cost of the iron, otherwise it would, in many instances, be cheaper to reinstate it.

The only means of protecting iron, hitherto in use, are paint and tinning; both of these methods possess the advantage of cheapness, but not durability. Paint is very easily destroyed, especially if moisture be present, and, therefore, is not fit to protect iron for any length of time, even when exposed to the atmosphere only.

The coating with tin would be a very efficient method of protecting iron, were it not for the electrical properties of these two metals. Tin is electrically negative to iron, and, by the law of electricity, when metals are in contact, the negative metal is protected at the expense of the positive, and therefore the tin is protected whilst the iron is more readily destroyed by its contact with it; besides, when two metals are in contact, the negative is made more negative, and the positive more positive.

In proof of this, we have only to refer to the celebrated experiments of Sir H. Davy. Copper, when alone, is readily acted upon by sea-water; but in contact with zinc or iron, metals positive to it, they are destroyed, and destroyed much more quickly by their contact with the copper, whilst that metal is rendered more negative by its connexion, and consequently protected. A proof of the operation of this law of electricity may be seen every day, in the state of iron railings which have been let into stone-work with lead, a metal negative to the iron; it will always be found that the parts in contact or adjacent to the lead are much more corroded than any other part, and this from the lead being negative to the iron, and thus destroying it. It has long been known that zinc, being electrically positive to iron, would by its galvanic influence protect it; but the insuperable difficulty was the mode of applying it; for, although zinc melts at a temperature of 773°, it very readily forms an oxide at this high temperature which does not melt. Still, from the importance of the subject, some attention during the last few years has been directed to it, especially in France, and about the year 1837 a patent was taken out in that country for covering iron with zinc, or what was termed galvanising iron; in this country, a joint-stock company was formed for carrying out the process, some of the leading iron-masters being interested in it; and so great was the importance of the subject then considered, that the enormous sum of 100,000*l.* was to be given for the patent if the process succeeded. After many fruitless attempts to carry it out, it was abandoned, from the difficulty experienced in maintaining the zinc in an unaltered fluid state. This process, however, is now being carried on, and therefore it is probable that improvements have been made in conducting it. The method of operating by this process is by plunging the iron into melted zinc, whereby a certain portion combines with, and is retained upon, the surface, in the same manner that iron is tinned. Many practical as well as theoretical objections present themselves to this process, and, in a report made upon the subject to the French Academy, M. Dumas says, "The zincing of iron made by steeping iron in a bath of melted zinc has many inconveniences; besides, the iron combining with the zinc constitutes a very brittle superficial alloy, the iron loses its tenacity,—a circumstance which is not perceived, however, except in trying to zinc fine iron-wire, or very thin plate; besides, the surface, being covered with a layer of not very fusible metal, is always ill-formed. Thus fine iron-wire cannot be zinced by this process, as it becomes fragile and deformed; bullets cannot be zinced, as they become misshapen and no longer of the same calibre." In order to prove the correctness of M. Dumas' account of the tenacity of iron zinced by the hot process, we procured 18 lengths of No. 18 wire, all from one hank, 6 being zinced by the hot process, 6 by the electro process, and 6 not zinced, and submitted them to tension. The 18 inches' length of wire not zinced stretched to 22 inches; that zinced by the electro process, to 22½ inches; and that zinced by the hot process, to only 19½ inches; shewing that, whilst the hot process materially interfered with the tenacity of

the wire, and entirely altered its condition, the electro process rather added to its tenacity.

The above is the mean of the results given by experiments upon six pieces of each. Another peculiar property of zinc when hot is the fact that zinc heated to 300° becomes tough and ductile, and is at that heat rolled into sheets; but above 400° it becomes brittle, and just below the melting point is so brittle that it may be pounded in a mortar like marble. Now zinc put upon iron at such a temperature has these evils: that portion which combines with the iron, for which it has a very great affinity, forms a very brittle alloy; and also that portion of zinc which adheres to this alloy, or coats it, does not possess the tenacity of ordinary zinc; besides, the contraction of hot zinc and iron being nearly as 3 to 1, the zinc being 3, the iron resists its contraction, so that the molecules of the metal have not the freedom of arranging themselves in that position necessary to ductility; for which reasons, zinc put upon iron by the hot process is brittle, and breaks by bending. Another objection is, that the zinc used in this process is not pure, not only from the presence of foreign matters required to keep the zinc in fusion, but from the impossibility, except at an enormous cost, of obtaining pure zinc; but, supposing these objections overcome, the alloy which the zinc forms with the iron at a melting heat destroys its protecting qualities. Impurities in ordinary metals tend, to a certain extent, to deteriorate their value; but impurities in zinc are its destruction, and this arises, as we have before stated, from the electro-positive qualities of zinc, and by which it protects other metals at the expense of itself.

Thus, supposing an atom of zinc to be surrounded with atoms of impurities, these, when brought into connexion and exposed to a fluid or to moisture, form a galvanic battery, the zinc being destroyed by this galvanic action, the time such destruction takes to be effected depending altogether upon the circumstances in which it is placed, whether in contact with moist air, water, or acid. This is the reason why the ordinary zinc of commerce does not last so long as might be reasonably expected from the known properties of that metal.

The hot process of zincing is also ill suited to the coating of articles of large dimensions, and all articles of minute workmanship must be necessarily injured by it, the melted zinc entering and filling up the outlines of the work. Before speaking of the electro process of zincing, we may say a few words upon the properties of zinc when in a state of purity. Dr. Kane says, "Zinc preserves the other metals, even if it be of iron, from oxidation; and again, zinc, when exposed to the air, even in presence of water, becomes covered with a varnish of a gray substance, probably a definite suboxide which is not further altered by exposure." Professor Graham, alluding to iron in water, says, "Articles of iron may be completely defended from the injury occasioned in this way by the more positive metal zinc, while the protecting metal itself wastes away slowly." And further speaking of zinc, "When exposed to air, or placed in water, its surface becomes covered with a gray film of suboxide, which does not increase; and this film is better calculated to resist both the mechanical and

chemical effects of other bodies than the metal itself, and preserves it." And Professor Daniell in his last work says, "that a plate of pure zinc, when immersed in water, speedily becomes dulled by the formation of a thin coat of oxide, but the oxidation proceeds no further, because the adhesion of the metal prevents a renewed contact of the metal and the water." We therefore see that, not only has zinc the property of protecting metals galvanically negative to it, but, unlike many other metals, becomes itself protected by its own oxide. We have before alluded to the difficulty of obtaining zinc in a state of purity except at a great cost, as well as the great difficulties, when so obtained of applying it to iron; the electro process fortunately saves us all trouble on these accounts, as impurities, though they may exist in the solution used, are thrown to the bottom, the pure metal only being deposited upon the iron. In the report to the French Academy we have before noticed, M. Dumas, in speaking of the electro process for the deposition of zinc, says, "Manufacturers, and those concerned in military affairs and the fine arts, will learn with interest that these processes enable us to zinc, in an economical manner, iron, steel, and cast-iron, by means of the pile, or battery, with the solution of zinc, by operating without heat, and consequently not interfering with the tenacity of the metal, by applying it in thin layers, and by thus preserving the general forms of the pieces, and even the appearance of their minutest details. The thinnest plate may receive this preparation without becoming brittle, and may be turned to account in roofing buildings."

This process is very simple. We take ordinary crystalised sulphate of zinc, dissolving it in water, in the proportion of one pound of the sulphate to one gallon of water, which forms our zincing solution. The iron to be zinced is first thoroughly cleaned by allowing it to remain for a short time in dilute sulphuric acid, and afterwards well scoured with sand: it is then placed in the zinc solution, attached to the negative pole of the galvanic battery (plates of zinc being attached to the opposite pole which face the articles in the solution) and the deposit takes place. After being a short time in the solution, the article should be taken out and scoured or brushed all over, so that any portion which may not have been very properly cleaned, and to which the zinc has not perfectly adhered in consequence, may be discovered. It is then returned to the solution and allowed to remain therein until a covering of the required substance is obtained. The advantages of this process are its simplicity, the absence of all injurious effect upon the iron, and the securing a coating of *pure* zinc. The largest articles can with facility be zinced, and articles of the most minute and elaborate workmanship are uninjured by the process. The operation may be intrusted to any one of ordinary capacity, and, what is of some importance in large operations, may be carried on *any where.*

It is not improbable that the practical details and manipulations of this process may be improved, but, in principle, we aver it is perfect. We need not particularize the uses to which iron so protected may be applied: to all the purposes for which iron is used it would be of ad-

vantage, particularly where it is exposed out of doors. The iron-work of all agricultural implements, harness and cart-fittings, fencing and hurdling, the iron-work of hot and green-houses, latches, bolts, and hinges, brestsummers of buildings, &c., &c.; in fact, its uses are infinite, and the application of the process only requires to be known to secure its general adoption.

We shall now say a few words upon copper as a coating for iron. Copper is another metal which may be used with great advantage to protect iron, especially for ornamental purposes. It was probably the deposit of this metal from the sulphate of copper, in Daniell's battery, which first suggested to Spencer the application of the decomposition of metallic salts by the agency of the battery. Since that period, the science of electro-deposition has been gradually developing itself, year after year adding to our knowledge, and, at the same time, shewing us how little we know of the subject in comparison with what yet remains to be discovered. Long before the discovery of deposition by an electric current, it was well known that a piece of iron or steel placed in a solution of sulphate of copper became completely covered with metallic copper; and iron has been long used for collecting the copper from water impregnated with it, both in Wales, Cornwall, and Ireland. Following up this practical result without being acquainted with the cause of copper being deposited upon iron, many were induced to follow out the process of coating iron by electricity with the sulphate of copper, and, finding that the coating thus obtained had no adhesion to the iron, considered their experience a rule, and thus originated the prejudice against coppered iron. The coating of copper received upon iron, when placed in the sulphate (or other *acid* solution) of copper, is not from any galvanic action, as many have supposed, but from a chemical substitution only; the iron having a greater affinity for the sulphuric acid of the solution, it leaves the copper for the iron, and the portion of copper thus thrown out of solution becomes loosely attached to the iron. And even the addition of a galvanic battery effects no change in the condition of the metals, the chemical action preceding the galvanic; and, although a coating may be forced on by the power of the battery, it is never in *direct* contact with the iron, but there is interposed a portion of oxide, and the copper thus deposited may be removed with the slightest friction; so that the trials made with iron so coated have failed. So strongly has the prejudice thus created operated, that we have heard it asserted, within these few days, that it was impossible to give to iron a permanent coating of copper. In March, 1840, a patent was obtained for securing perfect and permanent coatings of copper upon iron, alkaline instead of acid solutions being used. Those we have found less suited to the purpose are the cyanides and ferro-cyanides, and what we have lately adopted is the ferro-cyanide of copper dissolved in the cyanide of potassium.

After the iron has been properly cleaned it is placed in this solution, heated to about 120°, in connexion with the battery: in from two to five minutes it will be found completely coated. The iron should

then be scoured with sand, and placed in an acid solution (by preference for cheapness the sulphate); if any portion of the iron should not have been coated in the alkaline solution, such part will immediately turn black, in which case it should be cleaned and returned to the alkaline solution for one or two minutes.

By this process any article of iron-work, whether cast or wrought, may be firmly coated with copper. To test the adhesion of the metals, we have had many iron bolts, of thirty inches long, driven through African oak of twenty-four inches thick, and with a very tight drift, without in the least disturbing the coating of copper; we have also heated them to a heat far above redness, and then plunged them into cold water, without any injury arising from the difference of expansion and contraction of the metals.

We are aware that an objection may be made to the use of copper as a preserving coating to iron, viz: that, the copper being the negative metal, the galvanic action is against the *iron*. We admit this; but, if the coating of copper is perfect, this cannot be the case, as no galvanic action can possibly take place unless the metals are both together exposed to the fluid. The resisting qualities of copper to oxidation, when exposed to water and vegetable acids, render it a valuable protection to iron under all ordinary circumstances.

For ornamental work copper is best adapted, as it takes a beautiful bronze, either by exposure to the atmosphere or by artificial means. A great saving might also be effected by casting statues and other ornamental work in iron, and afterwards coppering it. The iron castings of the Colebrook Dale Works cannot be surpassed for sharpness and effect.

Works of art in iron, plasters, terra cotta, wood, and other substances, may be thus made to resemble antique bronzes, and the process may be advantageously adapted to machinery, especially that which is exposed in damp situations.

We may add that iron either zinced or coppered solders with great facility. Trans. Soc. Arts.

Advance of Iron Shipbuilding—Iron Collier.

A great deal of curiosity has been excited by the arrival in the Thames of a Newcastle collier; she is a fine-looking vessel, built of iron, and fitted with a screw propeller worked by an engine of 20-horse power; which is said to combine the advantages of several recent patents, and still different to all; it consists of four flies or flaps of peculiar construction, bending over an angle of 45 degrees from a line with the axle; she is 130 ft. long, 27 ft. 6 in. wide, and, when loaded with 340 tons of coals, her draught is only 11 ft. 9 ins. aft, and 10 ft. 3 ins. forward; her hold is divided into separate chambers, after the principle of C. W. Williams's water-tight bulkheads, and each has a hermetically closed false door, into which water can be admitted by large taps, for ballast, and when not required is pumped out

again by the engine. Her bows are sharp and wedge-like, and her stern unusually projecting; though low, her counters are so flat that she lifts with every swell, and it is nearly impossible for a wave to break over her taffrail. She is called the *Q. E. D.*, and on her stern is an armorial bearing, with the motto—"*Spes mea Christus.*" From the step of the mainmast to the cap is 65 ft. and from her keel to the royal truck about 130 ft.; her mizenmast is of iron, and hollow, forming the engine chimney, and the emission of the smoke from such a situation has a very singular appearance. We understand she both sails and steers well, and the propeller has answered every expectation. She was built by her owner, Mr. Cootes, of Walker's Quay, Newcastle, and from the growing evidence of the superiority of iron for shipbuilding in lightness, strength, and economy, it is probable in a few years few will be constructed of wood, and that scarce a sailing vessel will be without a screw propeller, to have recourse to in time of need.

Mining Journ.

Machinery for Carving.

A patent having been taken out some time since for a method of carving wood and stone by machinery, a large manufactory has been established by Mr. Pratt, of Bond Street, for the purpose of working it. The uses to which it is at present principally applied are to carve elaborate foliated tracery, crockets, finials, &c., required for external and internal paneling in wood and stone for churches. The rapidity and consequent economy with which the work is effected are astonishing. We saw, on a recent visit, a small piece of trefoil paneling in stone finished in 15 minutes, which by the ordinary processes would employ a skilful workman a whole day. Nor is the rapidity of execution detrimental to the accuracy and finish of the workmanship. We carefully examined a great number of the specimens, and were satisfied that the materials were not susceptible of more perfect finish. In the crockets, finials, bosses, and other solid work, indeed, much has to be done by hand after the mechanical work is finished. The mechanism here only cuts away the larger parts, and prepares a ground for the hand of the carver. But in paneling, little or nothing is left to manual skill; all that is requisite is to retouch some of the acuter angles of the tracery.

The machinery by which these wonderful processes are effected is, like all valuable machinery, very simple. Many of our readers have probably seen the experiment, which used to be performed in the Adelaide Gallery, of cutting through the hardest steel files by a circular disk of soft iron which revolved with very great velocity. This principle of increasing the efficiency of cutting tools by making them revolve with great rapidity is utilized in the present patent. Drills of various shapes are caused by steam power to revolve rapidly in a vertical position. The extremities of the drills are serrated, and it is therefore obvious that they will rapidly cut through wood or stone

when presented to them. By guiding the wood or stone in a proper manner the drills may be made to cut them into any form required.

This is the general principle. The following is the manner in which it is carried into effect for carving an oak panel. A slab of solid oak is firmly fixed to a flat table which is capable of turning on its centre. On the slab is closely screwed a templet of iron, in which apertures are cut corresponding in form with the parts to be incised in the oak. The revolving drill is supported by a radial bracket, which can swing horizontally, and can be raised or lowered as may be desired when set to work. The workman depresses the drill and brings it to bear on one of the portions of the slab which appears through the apertures of the templet; and by slightly turning either the bracket of the drill or the table, he can bring the drill to act on any part of the slab. Consequently by guiding the drill all round the edge of the aperture of the templet, he speedily cuts away the wood to an uniform depth and of the exact shape of the pattern.—The wood has now been pierced through to the requisite pattern, but the edges of the parts incised are plain and perpendicular to the sunken. These plain edges must be converted into mouldings, and for this purpose fresh drills are substituted, the templet still remaining. These drills vary in shape according to the moulding required; they are, as before, worked round the edges of the pattern, and by undercutting laterally produce the desired forms.

The invention is capable of extension to many purposes beyond those to which it is at present confined; chimney pieces, furniture of elaborate pattern, and articles of slate may be produced at a greatly diminished cost. Carved furniture and paneling which have hitherto been confined to the palace and the mansion, may by these means find place in far humbler dwellings.

The mechanism which Mr. Pratt has constructed for such important objects must be valuable in every respect; and we deem it no small part of the benefit arising from the construction of a great public work like the Palace at Westminster, that men are thereby stimulated to the discovery of such inventions as the present. We should state that the invention is due to a Mr. Irving, who attends to the working of the machinery. Mr. Pratt is now engaged in constructing a roof for Great Malvern Abbey, full of tracery, including the tie beams and spandrels; the dimensions of the roof are 90 ft. in length and 30 ft. in breadth; the cost, including the wainscot, will not be more than £1,500, and it is to be finished within eight months after the order was given. The cost of such a roof constructed by manual labour would be at least from £5000 to £6000. A piece of tracery containing 2 square feet and 2 inches thick will not cost more than 14*s*., including the oak. We must not omit to mention that Mr. Pratt has engaged Mr. Billings, well known by his works connected with Gothic Architecture, to attend to the architectural department.

We are informed that the principal part of the decorations in oak of the interior of the New Houses of Parliament is to be executed by the aid of this machinery. **Civ. Eng. and Arch. Journ.**

On Improvements in the Manufacture of Glass for Optical Purposes. *By* Mr. Claudet.

Heretofore, the manufacture of glass fit for the purpose of the optician has been a matter involving great uncertainty and difficulty, and in fact it was not until the year 1744 that it was accomplished with any degree of success. About this time, however, a Swiss named Guinand, in making some experiments in the construction of the telescope, found the extreme difficulty of procuring glass fit for lenses; the difficulty led him to endeavour to make glass for himself, and from his labours arose the first process by which glass could be made with certainty sufficiently good in quality for the construction of optical instruments. With the death of Guinand his secret was partially lost. The invention which forms the subject of Mr. Claudet's paper is founded upon the process of Guinand, and is due to a French glass manufacturer named Bontemps, whose attention was first drawn to the subject by the son of Guinand himself. The chief defect in optical glass consisted in striæ and spots; these arose from the great difficulty of properly mixing the materials when in a state of fusion; it was impossible to stir the melted mass, because the temperature was so high as to destroy the instruments of metal, and besides by introducing them into the glass it would have been tinged with color, according to the nature of the metal employed. The method used by M. Bontemps is to introduce the iron rod used in stirring into a clay cylinder closed at one end, so that the glass is entirely protected from the injurious action of the iron; the ingredients are thus effectually mingled; the glass is then suffered to cool gradually, the crucible broken with care, and the mass sawed transversely into slices, so that lenses may be obtained of the diameter of the crucible. Very large lenses have been produced by these means, and two of a metre in diameter are now in progress of manufacture for the Royal Observatory at Paris.

Trans. Soc. Arts.

Additional Remarks respecting the Condensation of Gases. *By* M. Faraday, Esq.

The author, suspecting the presence of nitrogen in the nitrous oxide on which he had operated, repeated his experiments with this gas very carefully prepared from pure nitrate of ammonia; but the results still indicated the presence of a more volatile gas mixed with another less volatile. He found that olefiant gas is readily soluble in strong alcohol, ether, oil of turpentine, and other bodies of the same kind; and that, like the former gas, it seems to be of a compound nature. His experiments confirm the prevalence of the law that the force of vapor increases in a geometrical ratio for equal increments of heat, commencing at a given amount of pressure. The more volatile a body is, the more rapidly does the force of its vapor increase by an augmentation of temperature; the increase of elasticity being directly

as the volatility of the substance. By further and more accurate investigations, a general law may be established for deducing from only a single observation of the force of any given vapor in contact with its fluid, its elasticity at any other temperature.

Trans. Royal Soc.

Rapid Printing.

A curious instance of rapid printing has come to our knowledge, which is worth recording. The Lords of the Admiralty ordered that the Nautical Almanac for 1845 should be reprinted. The old edition of 8,500 copies had been exhausted: and, as sometimes happens with this work, copies were selling at twelve times the original price to those who absolutely required them, and had neglected to procure them. The order was given on the *fourth* of last month, and on the *twenty-fourth*, only seventeen working days having intervened, complete copies were sent to the binder. This Nautical Almanac contains 616 large octavo pages, *of which 572 are filled with numerals*, and the rest with small print. The printers, Messrs. Clowes, were (to save time) intrusted with the complete supervision, not a single sheet being sent to the Nautical Almanac Office to be compared with the old edition until it had been finally worked off. The result of careful examination at the Almanac Office, made as soon as each sheet was finally dismissed from the printers, shows a list of 33 errata, or one for every 19 pages: and most of these errata are trivial. Two of them are only wrong rules; nine of them consist in the dropping out of a letter or figure at press, which happens in the most deliberately printed works; one of them is a substitution of a word in capitals for one in Roman letters. Some people will at first imagine that the type of the first edition remained standing, and that the new edition was printed from it. But the first edition was printed *four years ago*. Truly we have here a striking instance of the power of a printing-office.

London Athenæum.

Enamel Portrait on Porcelain.

The silver Isis medal was presented to Mr. J. Haslem, for his Enamel Portrait on Porcelain.

In the large enamel portrait of the Duke of Wellington submitted to the Society, the object has been to combine the force and freedom of an oil-painting with the richness of color and brilliancy of an enamel; and the following is the way in which this was executed.

An oval wood panel was procured in the first place, and the portrait painted on it in oils. Two colors only were used for this purpose. In the lights the color was laid on thick and prominent,—in short, it was painted with a considerable *impasto*. From this painting, when it was sufficiently dry, a mould was taken in plaster of Paris; the porcelain clay was pressed into this mould, and a slab, or plate, thereby made, on the surface of which was an exact impression

of the original painting on the wood panel. After the slab had been fired and glazed, it was painted with enamel colors, in the way highly finished paintings upon porcelain are usually done, *i. e.* it was first what is called "washed in," and fired in the enamel kiln, painted over again, and fired again, and so on until it was finished. For this purpose it passed through the enamel kiln five or six times.

This portrait should not be taken as a perfect specimen of a new style; it is only a *first experiment*, and by no means so perfect, as far as the impasto is concerned, as it ought to be. In making the slabs in the first instance considerable difficulty was encountered. As is often the case in making large pieces of porcelain, many were spoiled by breaking, and otherwise, before one could be got to stand the firing. By the time this was done the mould had lost a good deal of its sharpness. The slab afterwards got too thick a coat of glaze, by which the impasto suffered still further. From these two causes the impasto is not nearly so sharp as was intended; consequently the picture has lost a great deal of that *crispness* which it was anticipated one got up in this way would possess: and probably it has lost from the same cause something in *effect* also. Trans. Soc. Arts.

Electric Clocks.

The following extract from a letter from Mr. Finlaison, of Loughton Hall, appears in the *Polytechnic Review*:—"Mr. Brain has succeeded to admiration in working electric clocks by the currents of the earth. On the 28th of August he set up a small clock in my drawing-room, the pendulum of which is in the hall and both instruments in a voltaic circuit as follows:—On the N. E. side of my house, two zinc plates, a foot square, are sunk in a hole, and suspended to a wire: this is passed through the house to the pendulum first, and then the clock. On the S. E. side of the house, at a distance of about forty yards, a hole was dug four feet deep, and two sacks of common coke buried in it; among the coke another wire was secured and passed in at the drawing-room window, and joined to the former wire at the clock. The ball of the pendulum weighs nine pounds, but it was moved energetically, and has ever since continued to do so, with the self-same energy. The time is to perfection, and the cost of the motive power was only 7*s.* 6*d.* There are but three little wheels in the clock, and neither weights nor spring; so there is nothing to be wound up." London Athenæum.

On Robinson's Patent Drying Machine. By J. Robinson.

This machine was first used in the manufactories of France for the purpose of drying fabrics of wool, cotton, and linen, and was found to produce a great improvement in the color and appearance of the articles passed through it, as well as a considerable saving of labor and fuel.

It has been used with equal success in this country, as by means of the machine all kinds of scoured and dyed wool, woollen cloths, flannels, stuffs, mousselines de laine, merinos, printed cottons and silks, dyed worsted yarns, &c. &c., as well as all articles requiring bleaching (put into it quite wet,) will be sufficiently dry in six minutes to work and finish off, leaving a suppleness of texture and brilliancy of color unattainable by heat.

Trials of the machine have been made at the Royal Naval Hospitals at Haslar and Plymouth, the officers of which establishments report most favorably of it. At Haslar Hospital the result was

1st Trial.	6 Blankets 2 Flannels	wrung in 4 minutes	From the period the machine reached its velocity, and every part of the articles equally dried or wrung.
2d Trial.	9 Sheets 28 Shirts	wrung in 8 minutes	
3d Trial.	15 Blue coats 21 pairs of Stockings	wrung in 4 minutes	

From hanging up in the drying-room, thermometer 101°.

A Blanket, thoroughly dried and fit for use, in	. . .	1 hour,	23 minutes.
A Sheet	. . . . .		41 "
A Shirt	. . . . .		57 "
A Blue Coat	. . . .	1 "	45 "

At Plymouth Hospital the result was—

1st Trial.	6 Blankets 15 pairs of Stockings	wrung in	6	minutes.
2d Trial.	10 Coats 10 Trowsers	"	5	"
3d Trial.	11 Sheets 20 Shirts	"	8	"

The machine consists of two boxes revolving on an axis with great rapidity, the number of revolutions when at its full velocity being at the rate of 300 per minute. It is set in motion either by cog-wheels or a strap and pulley with an ordinary handle. The boxes are inclosed in an outer case to prevent the water from flying about, through which case the air enters by means of openings at the sides and ends.

Trans. Soc. Arts.

Method of Preparing Benzoic Acid. By Dr. Stenhouse.

Proceed as in Sheele's process, by mixing finely pulverized gum-benzoin very intimately with its own weight of slacked lime, also in fine powder. The mixture is to be repeatedly boiled with water so long as any benzoate of lime is dissolved. The filtered liquid is to be evaporated to about one sixth of its bulk, and a considerable quantity of a strong solution of hypochlorite of lime is to be added to it.

The mixture, while boiling hot, is to be decomposed by a slight excess of muriatic acid, and the boiling continued till all the chlorine is driven off. On the cooling of the liquid the benzoic acid is deposited in crystals, which are but very slightly colored, the greater portion of the coloring matter having been removed by the chlorine. The crystals, however, still retain some resinous matter, from which impurity they may be readily freed by being once or twice dissolved in a very small quantity of boiling water and recrystalized. A little purified animal charcoal may also be advantageously employed for this purpose.

Lond. Edin. & Dublin Philos. Mag.

On the Quantities of Rain received in gauges at unequal Elevations from the Ground. By Prof. Phillips.

The author, referring to three Reports which he had already presented, observed that the results arrived at, on York Minster, on the Yorkshire Museum, and on the ground at York, for three years, appeared to require no repetition, and that the reasoning on the results having been generally accepted, he should have thought it unnecessary to recall attention to the subject, unless he had some new facts to communicate. On duly estimating the force of the objections which had been, or might have been, urged against the former experiments, such as the influence of local eddies and currents of wind about the Minster and Museum, and such buildings generally, Prof. Phillips resolved to establish a registration of gauges raised into the open air, to various heights, independent of buildings. He had carried on trials of this kind at intervals for more than five years, and after using globular gauges, and various modes of measuring the rain collected, he had finally employed for the last two years, funnel gauges, emptying themselves into reservoirs placed in the ground. Thus some particular difficulties were obviated, and a consistent tally of results obtained. In 1843, from January 9 to October 14, he had obtained registrations of the gauges almost continuously, and in 1844, a similar series from January 1 to September 2, was recorded for him by Mr. Cooke. The gauges are five in number, at 1½, 3, 6, 12, and 24 French feet above the ground. The registration for the two periods are as under:—

	1843. Inches.	1844. Inches.	Sum. Inches.
24	14.618	9.540	24.158
12	15.419	10.620	26.039
6	15.549	10.640	26.189
3	15.608	10.690	26.298
1½	15.619	10.940	26.559

On these facts the author forbore to comment, having the intention to vary the experiments.

The Earl Fitzwilliam observed, that although the quantities collected in the several gauges differed somewhat for the two years, yet it was remarkable that the proportions were much the same.

Proc. British Assoc.—London Athenæum.

On Simultaneous Barometrical Registration in the North of England. By Prof. PHILLIPS.

Following out a limited district in the plans of contemporaneous hourly registration, which had been prosecuted by Sir J. Herschel and M. Quetelet, for larger areas, the author found the means to combine observations on the barometer, attached thermometer and direction of wind, for twenty-four hours in each month, at nine stations in the north of England: viz. Kendal, Shields, Whitby, Scarborough, Hull, York, Sheffield, Birmingham, Manchester. The observations of five of these stations for six months, had been approximately discussed, viz. those of Shields, Hull, York, Sheffield, and Birmingham, and the results projected in diagrams. They showed, 1. the remarkable *general* accordance in the forming of the contemporaneous curves at all the stations. 2. The various limits of the deviations from uniformity, never amounting at any two stations to above one-twentieth of an inch. 3. The passage of waves of greater or less pressure in directions nearly corresponding to the path of the wind at the time, and with velocities which appear proportioned to the general movement of the atmosphere at the time, viz. twenty to forty miles an hour. (The author announced a further communication on this subject in 1845.) Ibid.

Transit of Mercury.

TO THE COMMITTEE ON PUBLICATIONS OF THE JOURNAL OF THE FRANKLIN INSTITUTE.

Burlington, Vt., May 26, 1845.

Gentlemen,—I attempted ascertaining the time of the late transit at this place as accurately as my imperfect means would allow. I ascertained the time of my watch on that day by eleven pairs of equal altitudes, corrected for the change of declination; none of which gave the time more than four or five seconds from the mean, and the greater part gave it within two seconds, although it was very windy. My telescope did not authorize me to notice the external contacts; the internal resulted as given below. I had no micrometer to estimate the diameter of the planet, or its distance from the limb.

Internal contact, beginning 11 h. 30 m. 11 s. A. M., mean time.
Do. do. ending 5 53 56 P. M., do.

Yours, respectfully, JAMES A. DEAN.

ERRATA.

Page 266, from top 8th line, for "make" read "making."

"	"	from bottom	19th line,	for $\overline{\pi x - hn^2}$	read	$\overline{\pi x - hn}^2$	
"	"	"	17th "	$(n+\overline{1+n^2\frac{1}{2}})$	read	$(n+\overline{1+n^2}^{\frac{1}{2}})$	
"	210,	from top	10th line,	for 1.4433	read	1.4324	
"	"	"	12th "	.6369	"	.6366	
"	211,	"	8th "	6.04636	"	6.04369	
"	"	"	13th "	.4916	"	.4416	
"	"	from bottom	13th "	4.619:1.55	"	4.616:1.154	
"	"	"	5th "	.186	"	.116	
"	"	"	1st "	.167	"	.133	

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